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Southern Medical Association Sixteenth Annual Meeting, Chattanooga Tenn., Nov. 13-16, 1922

VOLUME XV SEPTEMBER 1922 NUMBER 9

MAY 18 1949
UNIVERSITY OF TORONTO

Southern Medical Journal

Journal of The Southern Medical Association

Published monthly by the Southern Medical Association, Empire Building, Birmingham, Ala. Annual subscription $3.00. Entered as Second-Class Matter at the Postoffice at Birmingham, Ala., under Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of Oct. 3, 1917, authorized Dec. 20, 1921.

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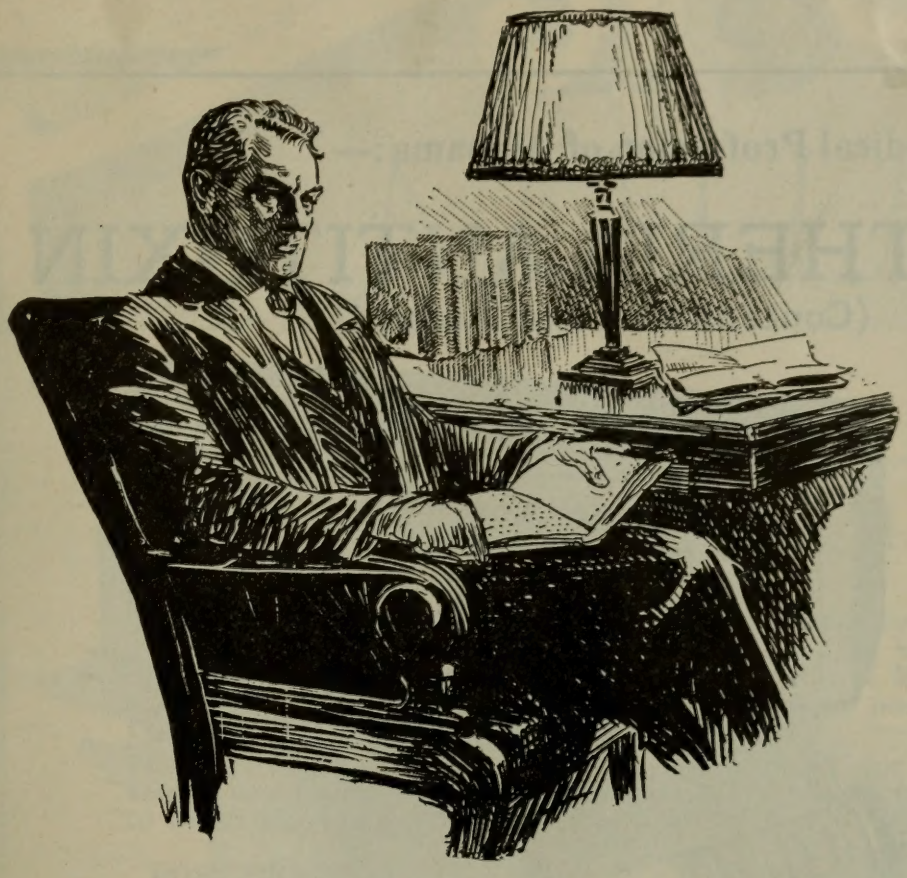

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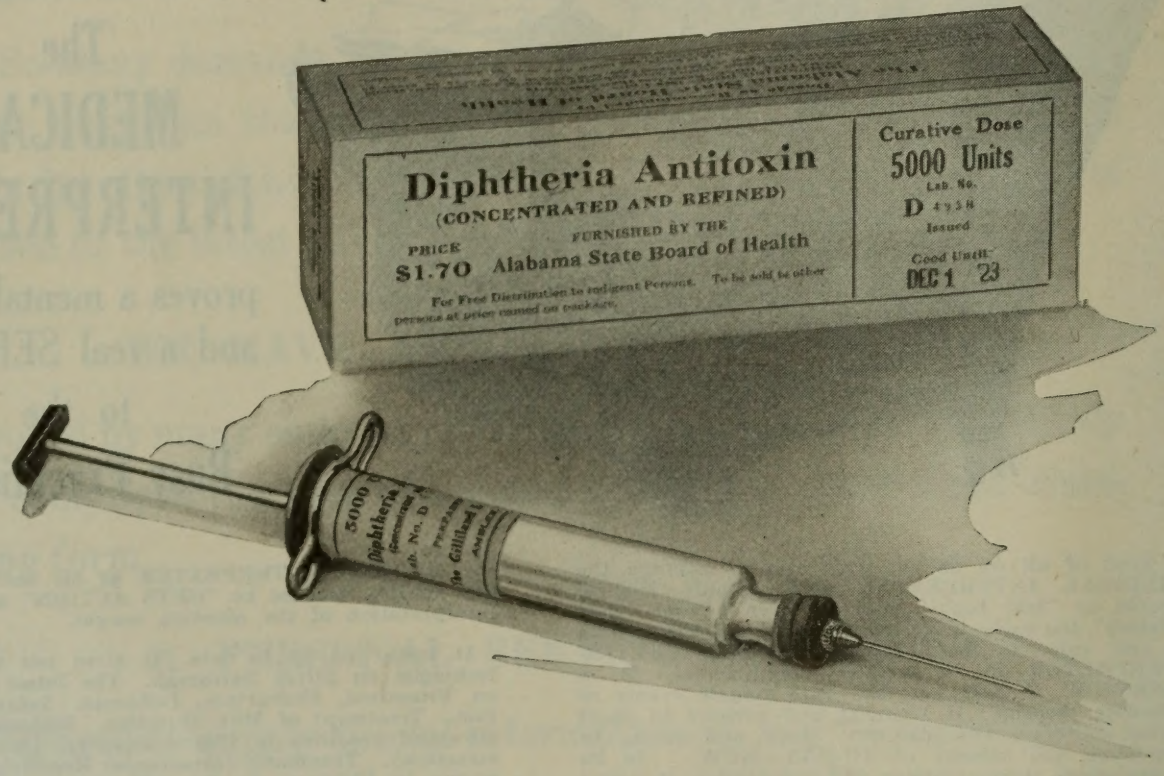

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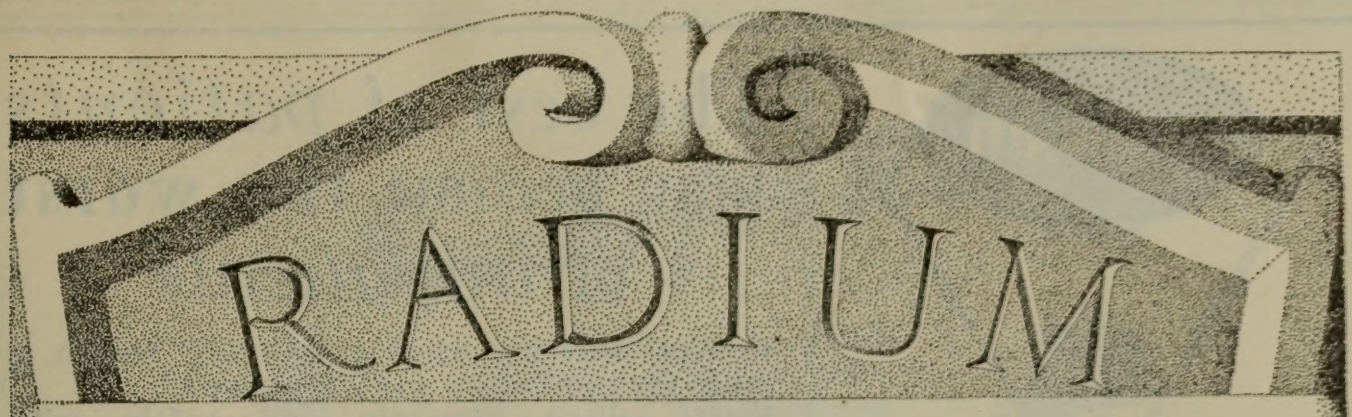

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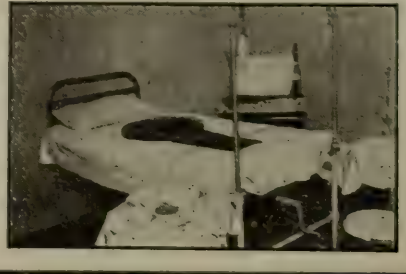

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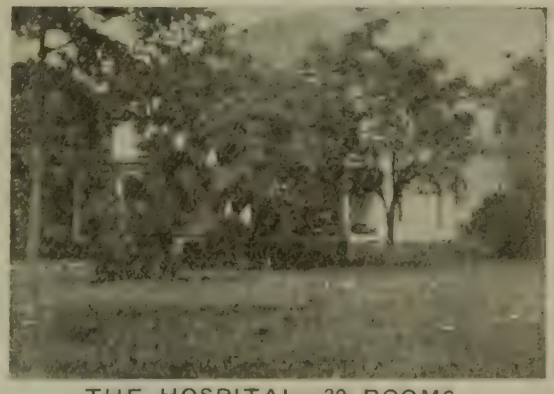

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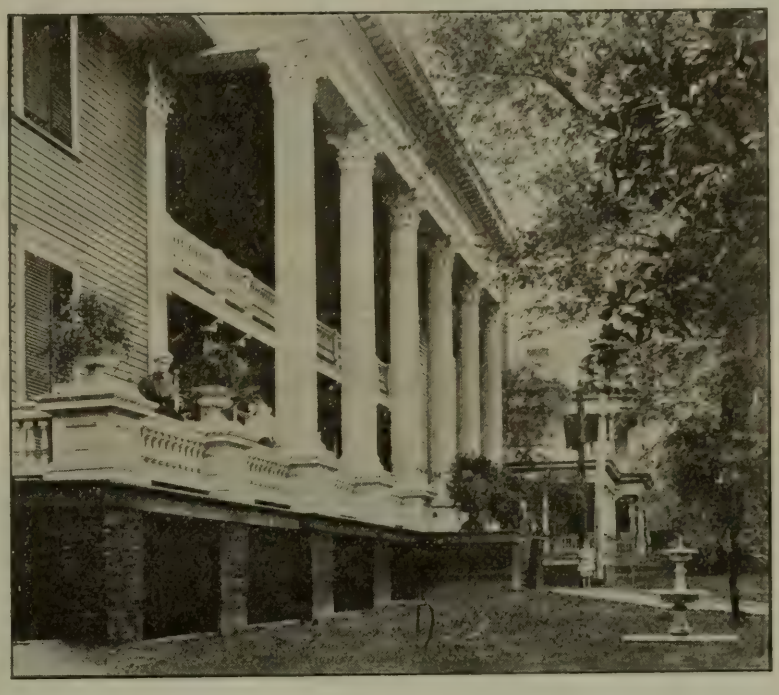

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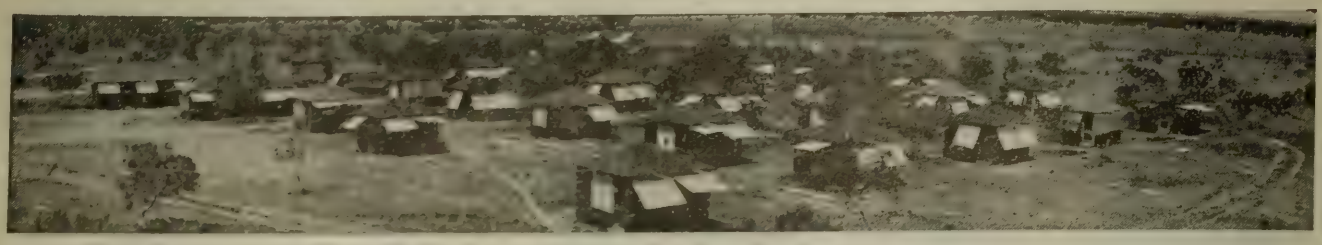

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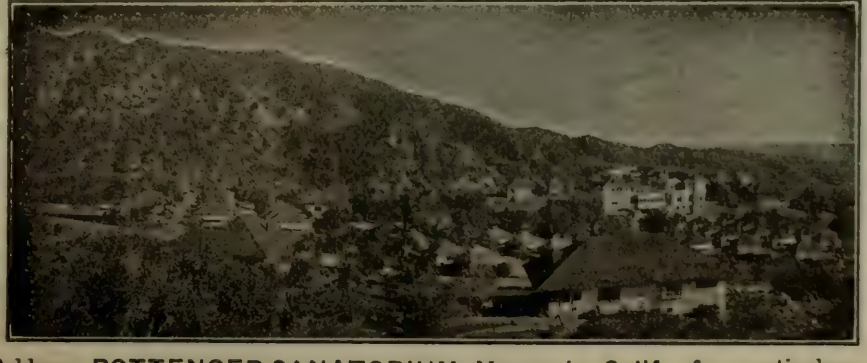

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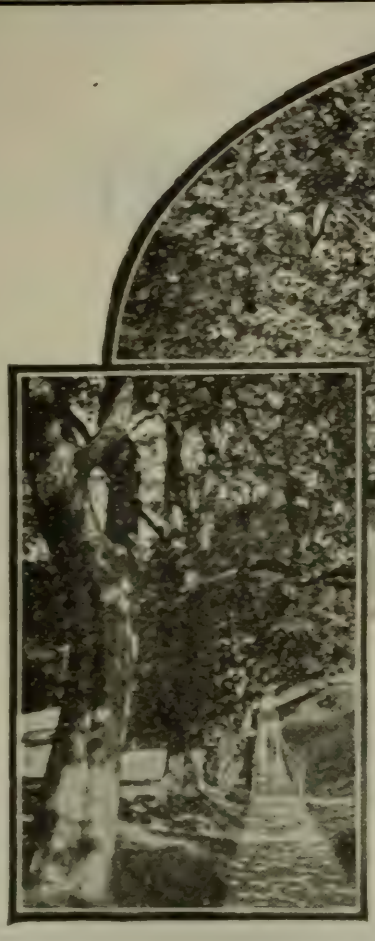

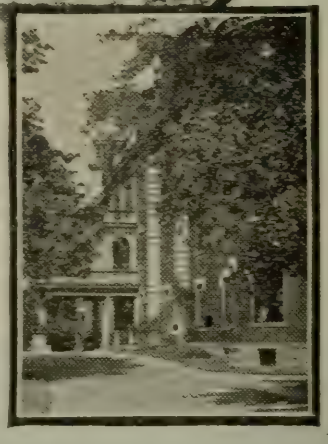

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Volume XV SEPTEMBER 1922 Number 9

MEDICINE

INTERNAL DISEASES, PEDIATRICS, NEUROLOGY, DIAGNOSTIC METHODS, ETC.

A PROCEDURE FOR DEMONSTRATING THE POWER OF THE KIDNEYS TO CONCENTRATE AND DIURESE THE NORMAL CONSTITUENTS OF THE URINE*†

By W. H. Olmsted, M.D.,
St. Louis, Mo.

Modern chemical methods have made it possible to study accurately the ability of the kidney to function. By the rapid micro-chemical methods of blood analysis the concentration of the excretory substances in the blood can be easily determined, and by the simplification of methods used for urine analysis, the concentration of these same substances in the urine is more easily determined than ever before. In addition to the determination of the rate of secretion of the normal constituents of the urine, the excretion of an injected foreign substance such as phenolsulphonephthalein has added a great deal to the success of accurately determining the state of kidney efficiency. But chemical analysis of blood and urine even with modern methods requires a well-equipped laboratory. The phenolsulphonephthalein test although recommended to the general practitioner by the majority of authorities as the best general test of kidney function, presents some difficulty, especially in the preservation of the standard color. The fading of alkaline standards is a real difficulty to the practitioner who requires determinations only at intervals of time. Our experience has been that new standards must be made up once a week and that alkaline phenolsulphonephthalein fades in a few days. Thus standard dilutions used as a comparative colorimeter soon become unreliable and weak. Those wishing to do good work are forced to the purchase of more expensive and more accurate instruments.

Mosenthal's[1] work on the normal response of the kidney to its normal stimuli, as shown by the variation of the specific gravity of the urine throughout the day and the small amount of night urine of high specific gravity, offers a method open to all those possessing a urinometer to learn very fundamental facts concerning kidney efficiency. Mosenthal has shown the relative value of this two-hour urine test contrasted with other tests. In his opinion, the following of the variation of specific gravity during the day, when the patient is taking the standardized diet, ranks among the most delicate kidney tests for the determination of early kidney involvement. Still, if we compare the phenosulphonephthalein excretion with the ability of the kidney to concentrate or rather its inability to do so, we see in Mosenthal's[2] figures that with the earliest demonstration of partial fixation of specific gravity there is shown a reduction in dye excretion. Have we really at our command sensitive enough tests to show beginning nephritis? Are there not more

*From Metabolic Unit of Department of Internal Medicine, Washington University.

†Read in the Section on Medicine, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., November 14-17, 1921.

simple methods for the early demonstration of nephritis, for instance, without the necessity of collecting two-hour specimens of urine throughout the day or requiring the patient to take a standard diet and measured fluid?

If one could force the kidney to concentrate so that with a normal kidney the specific gravity of urine were high, say 1025 or 1030, it might be possible to show that in early nephritis the degree of concentration of the urine or its specific gravity is not so high as in the normal individual. And if after forcing such an early diseased kidney to concentrate, a large amount of water were given, it is conceivable that there would occur an increased washing out of temporarily retained urinary constituents. It was with these ideas in mind that the present work was undertaken.

The method used to force the kidney to excrete a concentrated urine is a twelve-hour fast, during which neither food nor water are taken. The procedure is as follows:

After the evening meal at 6 p. m. the patient goes through the night without food or water. Between six and seven o'clock the bladder is emptied as completely as possible. The time of voiding is carefully noted. For three hours more the patient is asked to go without food or water. Exactly three hours after the six o'clock voiding the patient voids again. This urine represents a three-hour elimination of the body in a basal state after a twelve-hour fast and thirst.

Immediately on finishing voiding of the three-hour concentrated specimen the patient drinks two and one-half liters of warm water in the next one and one-half hours. This is not so difficult a task as it seems. It is quite possible to drink two liters of warm water in ten minutes. All urine voided for the three hours during and after the drinking of water is collected.

We have by noon of the day of the test two specimens of urine, the one of small volume, from 50 to 200 c. c. and of high specific gravity; the other of large volume, usually over 1000 c. c. and of very low specific gravity. Both specimens represent a three-hour basal metabolism. These urines will be referred to as the "concentration" and the "diuresis" specimens.

The plan of study has included other determinations. In all cases the phenolsulphonephthalein excretion was determined, and also the non-protein nitrogen, uric acid and creatinin of the blood. The clinical data noted were: urine examination for albumin and casts, blood pressure, presence of edema, size of heart and clinical diagnosis of its condition, the estimation of the degree of arteriosclerosis if present and finally the clinical diagnosis.

Fourteen normal young men have carried out the procedure, both the concentration and diuresis. Ten others have carried out only the concentrated period. One hundred hospital patients have been studied. The concentration and diuresis specimens of urine have been analyzed for urea, salt, creatinin, uric acid and phosphates. But it is not proposed this time to discuss the results of these later analyses.

Here I propose to discuss, first, the normal response of the kidney under the circumstances already outlined; second, to show variation in concentration and diuresis in certain types of pathological conditions; and third, to compare the ability of the kidney to concentrate and diurese with other tests of kidney function. Furthermore, I shall compare these tests at various levels of loss of kidney function.

NORMAL INDIVIDUALS

The specific gravity of urine of normal men during the concentration period varies from 1022 to 1032 and is in some instances above. The specific gravities here recorded are taken at a temperature of 20° C. It is very important to take the temperature of the urine because for every rise of 3° above 20 or 15° C., depending upon the temperature at which the urinometer is standardized, the specific gravity drops one point in the fourth place. Thus the correction of the specific gravity of urine at 37° C. would be to add six points to the last place.

The volume of these specimens varies from less than 50 to 200 c. c. but rarely so much as the latter amount. The relationship of weight to volume of urine is an interesting one. A normal woman of 90

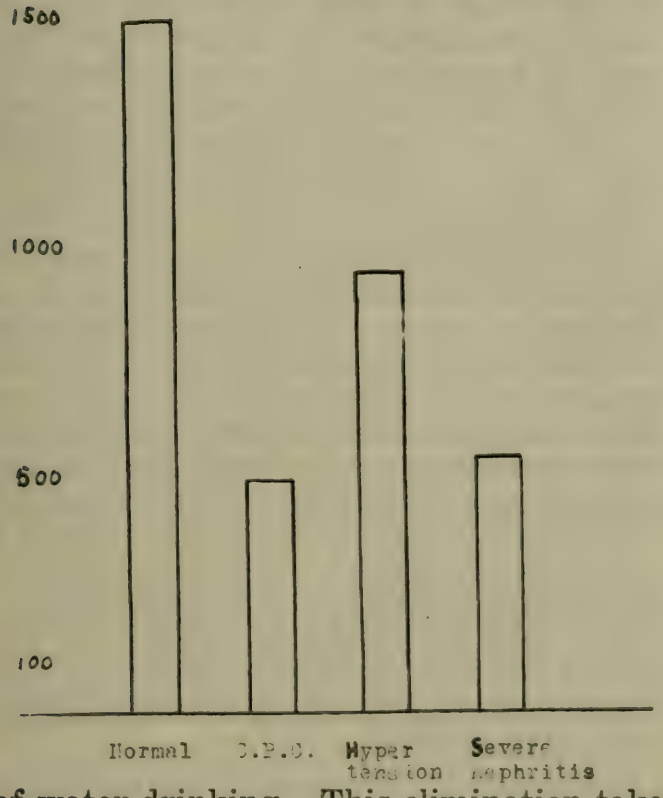
pounds will concentrate to 1020 but the volume may be but 35 c. c., while a 180-pound man will concentrate to 1025 but the volume will be 150 c. c. The normal kidney responds very quickly to the ingestion of water. In one and one-half hours

TABLE I—NORMAL INDIVIDUAL

Concentration Specific Gravity	No. of Cases	Diuresis Volume c. c.	No. of Cases
1022-1023	4	1000-1200	8
1024-1025	4	1200-1400	4
1026-1027	6	1400-1600	1
1028-1029	4	1600-1800	5
1030-1031	2		
1032-1038	1		

2,500 c. c. of water is ingested, and in another one and one-half hours the period is finished. So rapid is the response of the kidney to blood dilution that the normal individual will eliminate as an average 1,500 c. c., or 60 per cent, of ingested water in three hours after the beginning

VOLUME OF URINE PASSED IN THREE HOURS AFTER DRINKING 2,500 C. C. OF TAP WATER IN THE FIRST ONE AND ONE-HALF HOURS



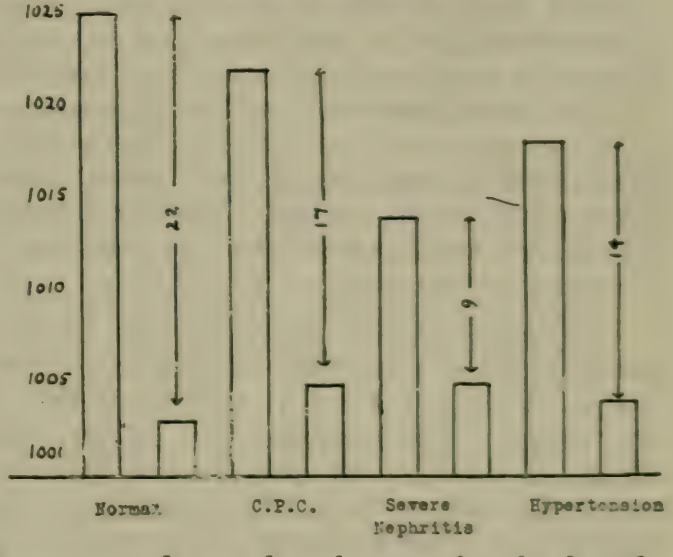
of water drinking. This elimination takes place, it is to be remembered, after fifteen hours of thirst. All specimens of urine passed after drinking this amount of water had a specific gravity of 1002 or 1003.

CARDIAC CASES

The findings in pathological states which affect kidney efficiency will be restricted here to three groups of conditions. The first of these is the group in which cardiac inefficiency dominates the clinical as well as functional picture. The cases here shown are selected as ones in which myocardial weakness almost wholly dominates the pathological picture. No cases are presented in which the phenolsulphonephthalein excretion was not 50 per cent in two hours. Edema was not present to any marked extent in any case and the cases had recovered from active signs of cardiac decompensation, such as dyspnea and orthopnea, if such conditions had been present.

The table shows the ability of the chronic passive congestion kidney to concentrate. The specific gravity of the concentrated specimen of urine almost equals the normal range. This ability of the kidney in heart disease to concentrate is quite well

SPECIFIC GRAVITY OF CONCENTRATED AND DILUTE URINE



known and can be shown clearly by the Mosenthal procedure. The inability of this type of kidney to diurese water is the striking fact shown by the concentration-diuresis test. Even with patients apparently in fair cardiac compensation after giving such a large amount of water, the decreased blood flow through the kidney can be demonstrated. It is well known to physiologists and has been repeatedly shown that to diurese water the blood flow or blood velocity flow through the kidney must be good. The ability to diurese water is a very good test for the velocity of blood flow through the kidney.

A good kidney and a poor heart will show a good concentration and normal

specific gravity, but a very limited ability to diurese water. The experience with the application of this procedure has led us to believe it of considerable assistance to the appreciation of the degree of cardiac factor where both heart and kidney are involved. The cause for this retention of water will not be discussed because it would take us to the discussion of salt diuresis and retention.

TABLE II—CARDIAC CASES

Phenolsulphonephthalein 50 Per Cent or More in Two Hours.			
Concentration Specific Gravity	No. of Cases	Diuresis Volume c. c.	No. of Cases
1015	2	300- 400	1
1020	3	400- 600	6
1021-1025	4	700-1000	2

ESSENTIAL HYPERTENSION

The second group is composed of cases showing arterial systolic blood pressure of 160 or more mm. of mercury. To this type of case has been given the name of essential vascular hypertension. These cases showed first of all a normal phenolsulphonephthalein elimination, and secondly hearts in good state of compensation. All of this group showed enlarged hearts — that is necessarily so — but the cardiac break had not occurred nor were there signs of decompensation. Definite sclerosing of the radical was seen at least in 50 per cent of the group.

The concentration-diuresis test in this group showed a lowered ability to concentrate. This lowering, it will be noted, is not great. The average, or, rather, the mean, of the specific gravities of the concentration period is 1020. Although the inability to concentrate is not marked, still the study of this group shows that these kidneys have lost some of the normal ability to excrete concentrated urine. On the other hand, the diuresis of water is excellent and practically at the lower limit of normal. Cases of hypertension show, first, beginning loss of power to concentrate normal constituents of the urine and, second, a good velocity flow of blood through the kidney.

TABLE III—ESSENTIAL HYPERTENSION. PHENOLSULPHONEPHTHALEIN 50 PER CENT OR MORE IN TWO HOURS

Concentration Specific Gravity	No. of Cases	Diuresis Volume c. c.	No. of Cases
1010-1013	2	400-500	1
1014-1017	5	500-600	1
1018-1021	6	600-800	4
1022-1025	2	800-1000	4
		1000 or more	6

SEVERE NEPHRITIS

The third group of pathological cases were chosen to show the findings in definitely advanced severe nephritis in which the kidney factor greatly dominates in the clinical and functional picture. Such cases were chosen so that the findings in the concentration-diuresis test could be seen with the picture of nephritis at its worst.

A question which will immediately arise is that regarding the advisability and difficulty of such very ill patients ingesting so much water. When first admitted to the hospital many of these patients could not take water because of nausea and the results here shown were obtained often only after considerable treatment. No injurious effects from water drinking combined with low protein, salt-free diet have been noted, but rather the opposite. Fluid forcing and diet are the mainstays of treatment. The findings show the great loss in the ability of these kidneys to concentrate. The loss of the power to concentrate is accompanied by some increase in the volume of the concentration specimen, but this is not always the case. Cases have been noted showing a volume during the concentration period of 450 c. c. of urine.

The failure of the severely diseased kidney to diurese water is as striking as in the cardiac cases. In this case, however, the failure to diurese water is more of a retardation or delaying of the excretion. The renal cells seem to have lost their extreme sensitiveness to blood dilution and respond more slowly. It is possible also that absorption from the gastro-intestinal tract is much delayed. The specific gravity of the diuresis specimen is always raised above 1002, the mean being 1005. The picture is definite—low concentration and reduction in the immediate diuresis following water drinking.

TABLE IV—SEVERE NEPHRITIS. PHENOLSULPHONEPHTHALEIN 0 TO 20 PER CENT IN TWO HOURS

Concentration Specific Gravity	No. of Cases	Diuresis Volume c. c.	No. of Cases
1010-1012	7	less than 500	1
1013-1015	2	500-600	4
		More than 600	1

The methods now used in all well-equipped clinics for the diagnosis of the degree of renal involvement are quite adequate, except in two particulars: first, the modern methods, as we pointed out at the

opening of this paper, require a chemical laboratory. Any new procedure should be along the lines of simplification of tests. This is one of the main purposes of the present work. Second, any new procedure should add to our ability to recognize at an early stage disease of the kidneys. It is this latter point that I now wish to discuss. Is it possible by means of this procedure to show kidney disease earlier than, for instance, by means of the phenolsulphonephthalein excretion?

TABLE V—CASES SHOWING EVIDENCE BY CONCENTRATION-DIURESIS OF EARLY KIDNEY DISEASE

Phenolsulphonephthalein, 50 to 55 per cent in 3 cases; 55 per cent plus in 13 cases.

Lowering of sp. gr. of concentrated specimen to 1020 or below, 14 cases.

Failure to diurese 1000 c. c. or better, 9 cases.

Slight increase in non-protein nitrogen (38-42), 6 cases.

Retention of uric acid, 7 cases.

Of these cases, 8 had hypertension; 4 had marked arteriosclerosis; 5 had acute nephritis; 1 had lead poisoning; and 1 had Raymeau's disease.

A group of sixteen cases is presented here. A more careful study of the material at hand will undoubtedly add to this number. All of them show a phenolsulphonephthalein excretion of 50 per cent or more in two hours. In none was there cardiac decompensation.

In 90 per cent the specific gravity of the concentration specimen was 1020 or less. In 50 per cent there was a slight reduction in the volume of the diuresis specimen. Usually the diuresis amounted to from 800 to 1000 c. c. There was a questionable retention of blood-nitrogen in six cases. Work* done in the writer's laboratory has shown that high protein diets can raise the fasting blood-nitrogen to 45 mg. per 100 c. c.

Slight retention of blood uric acid was noted in 40 per cent of these cases. Retention of uric acid is one of the early indications of nephritis, but it may or may not be present. It is not a dependable sign. The clinical evidence supports the contention that the slight loss in power to concentrate and diurese is evidence of early nephritis. One-half of these cases showed vascular hypertension. A third were cases of typical acute hemorrhagic nephritis with smoky urine, edema, etc. One-fifth showed marked thickening of the radial artery.

*By Ochsner, unpublished.

All of them showed conditions involving vascular lesions and such lesions as we know affect the kidney injuriously. From both the standpoint of clinical evidence and from findings of the laboratory, it seems justifiable to assume that this group showed early disease.

TABLE VI—CASES WITH BOTH CARDIAC AND NEPHRITIC DISEASE, CARDIAC STASIS PREDOMINATING

	Phenolsulphonephthalein	Concentration	Diuresis	Non-protein Nitrogen	Uric Acid	Creatinin
1	53	1020	460	34	2.7	1.4
2	46	1024	850	35	2.7	1.6
3	40	1019	78	27	3.6	1.4
4	32	1017	200			
5	21	1022	220	48	4.4	2.16

If loss of power to concentrate and diuresis be evidence of early kidney disease, is this test infallible? Are there cases showing nephritis by other tests where the concentration-diuresis procedure fails to show disease? In the analysis of these 100 cases, five have been found who showed normal response to concentration-diuresis test, while the phenolsulphonephthalein excretion was below 50 per cent. Certainly this is a smaller number than one would expect. An interesting fact well worth following up is that two of these five were cases of obstructive retention due to enlarged prostate.

TABLE VII—CASES WITH BOTH CARDIAC AND NEPHRITIC DISEASE, NEPHRITIC ELEMENT PREDOMINATING

	Phenolsulphonephthalein	Concentration	Diuresis	Non-protein Nitrogen	Uric Acid	Creatinin
1	66	1017	910	41	4.2	1.6
2	73	1015	1330	23	2.0	1.1
3	50	1010	1330	41	2.0	
4	45	1020	700	35	2.6	1.2
5	35	1014	800	36	3.18	
6	39	1015	970	36	3.1	1.02
7	7	1018	1260	43	4.3	1.7

Finally, I wish to compare briefly the concentration - diuresis test with blood chemical findings and phenolsulphone-

phthalein excretion. To do this I have chosen two groups of cases. Both groups have clinical evidence of serious disease of both myocardium and kidney.

If one has a moderate degree of nephritis and superimposed thereon a poor myocardium, what is to be found with the application of functional tests?

CARDIAC STASIS PREDOMINATING

In reviewing these cases one is rather struck with the fact that when stasis is superimposed upon nephritis there is a tendency for the kidney to concentrate at a higher specific gravity than one would suppose from other tests. That stasis gives opportunity for more reabsorption of fluid might be the explanation if one accepts Cushney's reabsorption theory of kidney physiology. The almost total failure to diurese, even less than the most severe nephritic, is the other outstanding point.

TABLE VIII—SCALE OF IMPAIRMENT OF RENAL FUNCTION AS INDICATED BY TESTS EMPLOYED (MOSENTHAL)

Degree of Impairment of Renal Functions	Phenolsulphonephthalein	Test Meal: Non-protein Nitrogen mg. per 100 c. c.	Night Urine: c. c.	Night Urine: Specific Gravity	Night Urine: Highest	Variation in Specific Gravity: Highest	Variation in Specific Gravity: 14-13	Variation in Specific Gravity: 12
Normal	60 plus	30-	400-1018		9 plus	6 plus		
	40-60	30-45	400 to 1016 &		8-5			
	25-40	45-65	600 to 1017		4-	5&4	6 plus	6
	10-25	65-90	600	1015		3-	4&5	5
	0-10	90 plus					3-	

NEPHRITIC ELEMENT PREDOMINATING

On the other hand, here we see (Table VIII) cases in which the clinical picture is mainly nephritis, but in which there is clinical evidence of some myocardial disease as well. Most of them were given the diagnosis of myocarditis. Attention is called to the fact that from the laboratory standpoint alone it would be impossible to differentiate by means of the chemical blood picture and the phenolsulphonephthalein excretion alone, cardiac and nephritic factors. The clinical picture and the results shown by concentration-diuresis test go hand in hand.

DEGREE OF IMPAIRMENT

Mosenthal has published this most interesting chart showing the degree of impairment of renal function as indicated by various tests. Attention is called to two points: first, Mosenthal has assumed that non-protein nitrogen values above 30 are pathological. Young healthy men on high protein diets, blood being drawn before breakfast, will show often a blood non-protein nitrogen of 38-45 mg. per 100 c. c. On the basis of this work, I do not consider a blood non-protein nitrogen to be pathological until above 40 mg. per 100 c. c.

TABLE IX—SCALE OF DEGREE OF IMPAIRMENT OF RENAL FUNCTION—COMPARISON BY THREE METHODS

Degree of Impairment of Renal Functions	Phenolsulphonephthalein	Blood: Non-protein (mg. per 100 c. c.)	Blood: Uric Acid (mg. per 100 c. c.)	Blood: Creatinin (mg. per 100 c. c.)	Concentration Specific Gravity	c. c. Diuresis
Normal	55 plus	25-38	2-3	1-2	1022-1033	1000 plus
Early	50 plus	25-38	2-3 or plus	1-2	1015-1022	800 to 1000 plus
Moderate	40-50	35-45	2-3 or plus	1-2	1014-1020	600-800
Marked	30-40	35-65	3 plus	1-2	1013-1020	500-800
Severe	Below 30	50 plus	3-12	1-2 or 2 plus	1010-1015	500-600

The second point to which attention is called is that the night urine is not increased nor its specific gravity lowered until there has been a reduction in the phenolsulphonephthalein excretion. It is questionable whether the test meal shows any kidney disease earlier than the phenolsulphonephthalein test.

A similar chart has been prepared showing the results with the concentration-diuresis test. Early kidney impairment is here demonstrated when other tests are normal.

It has been our experience that as soon as the phenolsulphonephthalein excretion is reduced below 50 per cent in two hours, or, as here shown, "moderate" degree of

impairment, that the case may progress to the "severe" degree of impairment in a relatively short length of time. The phenolsulphonephthalein test, in our opinion, when reduced below 50 per cent, indicates beginning kidney decompensation or well advanced disease and not early kidney disease. The retention of non-protein nitrogen in the blood, when due to kidney disease, indicates that the decompensation is well marked and the disease far advanced.

CONCLUSIONS

We believe the concentration-diuresis test worth consideration for three reasons: because of its simplicity of application and for its information suggesting early disease, and because it gives definite information of the relative importance of the cardiac factor. The other tests are of great value, but the difficulty attending their application goes to recommend this procedure especially to the general practitioner.

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DISCUSSION

Dr. Louis Hamman, Baltimore, Md.—In my contact with physicians I find that most of them have a timid attitude toward renal function. They realize how important it is clinically to determine changes in kidney function, but the subject has been so obscured for them by discussions of nitrogen partition in the urine and blood, of non-protein nitrogen, urea nitrogen, ceratinin, Ambard's coefficient and so forth that they believe only an expert can understand these intricacies. When a subject first comes under investigation, the methods used and the results they yield are complicated and somewhat obscure. It is only when more and more information has been gained from these studies that finally the methods become simple and the results direct and clear. This is what has happened in the field of renal function. From elaborate studies have come simple methods which yield to the practitioner the greatest amount of information as a reward for the least expenditure of time and thought.

The physician must understand that the most important test of renal function is a study of the excretion of water and solids. The specific gravity of the urine is the index of the excretion of solids and the amount of urine compared with the fluid intake tells how the kidneys excrete water. Numerous detailed methods have been devised to determine these relations. Dr. Olmsted has just outlined one that is simple and quite satisfactory. However, it matters little which method the physician uses, provided it is a good method and he uses the method constantly and intelligently. By holding fast to one method he soon learns accurately to interpret the results, he becomes familiar with its shortcomings and possible source of error and its helpful clinical implications.

I believe that a study of the urinary secretion and specific gravity of the urine will give more information about renal function than any other test. However, it is often advisable to have another method as a check on the results, and for this purpose the 'phthalein test is to be recommended particularly to physicians. The test is very simple and requires no complicated or expensive apparatus. The ampoules in which the dye is marketed contain over 1 c. c. of the solution, and after this amount has been injected into the patient a standard can be easily prepared fresh for each test by adding 1/10 c. c. of the dye to 100 c. c. of water made alkaline with a little sodium hydroxid. The amount of dye in the urine can be easily read by comparing the diluted urine with the standard in two test tubes of equal caliber. From the amount of water added to the standard to bring it to the same color as the diluted urine the amount of dye present in the urine can be easily computed.

Dr. C. W. Dowden, Louisville, Ky.—Any procedure that adds to our present knowledge of kidney function is, of course, greatly welcomed. That procedure which is easily applied and requires little knowledge of chemistry naturally should have precedence over the more elaborate methods because of its broader application.

Dr. Olmsted is to be congratulated on this original work chiefly because of its simplicity. Many of you will no doubt recall that two years ago I contributed a paper on much the same character of work, comparing the results obtained from a study of the specific gravity of urine over several days' period as well as the study of the fluid balance, with the more elaborate methods for studying kidney function, consisting of the blood chemistry, the Ambard coefficient and the phenolsulphonephthalein excretion. Quite a number of cases were studied in this manner, and our final conclusions were that as much or more evidence was obtained from these simpler methods than from the more elaborate ones.

We have now on record one case that has been under constant observation for a period of two years in which an accurate record of the intake and output of fluid as well as the specific gravity of urine has been kept. Several other cases have been watched over a period of several months. It has been my experience that in a few cases it has been impossible to increase the intake beyond a certain point without producing annoying symptoms. In the case just mentioned, if the fluid intake exceeds 16 ounces it is sure to be followed by more or less edema with considerable dyspnea. It has, therefore, occurred to me that in possibly a few cases where the fluid balance is greatly disturbed and the patient will eliminate only a certain amount of fluid that to increase his intake to 2½ liters might produce unpleasant or even dangerous symptoms. This would be more likely also if the condition were associated with an arterial hypertension of any great extent.

It might be advisable in this particular type of case to determine for a short period of time what

the response might be to the injection of smaller quantities of fluid.

Dr. George Dock, St. Louis, Mo.—I have followed this work of Dr. Olmsted with great interest and have been familiar with all patients he has worked on, and I would like to testify not only to the accuracy of the work, but also to the volume of work which he did not bring forth here. Many of us have been using for a long time the comparison of day and night urine. It is difficult to get accurate measurements of the day and night urine. This method is convenient for practitioners to carry out.

As to its safety, Dr. Dowden's remark is correct in regard to the few cases of severe kidney disease. No doubt there are some patients in whom it would be risky to give so much water. But in practice an important test like this is for the earlier cases, for the patient whose functions we wish to learn and to follow up and check up under treatment and under diet, and so on. In such cases a few liters of water are not dangerous for the circulation or the kidneys themselves.

Dr. Olmsted (closing).—Any one who follows the specific gravity of the urine of a patient for years, with many specimens taken at different times during the day and after meals, will have a very accurate knowledge of the function of that particular patient's kidneys.

I wish to urge upon those who are interested in teaching students clinical microscopy the importance of impressing upon the student the value of the urinometer and to urge his constant use of it.

We followed the blood pressures in cases before and during the water drinking in an effort to see if there is any injury done or if the systolic pressure went up. We were rather surprised to find it did not go up.

In uremic cases it is difficult to apply this test. I do not believe the specific gravity is of so much value as the 'phthalein test when kidney disease is advanced. Water drinking and response of the kidney to diuresis at that stage gives a better picture taken with the 'phthalein test than the ability of the kidney to concentrate.

A CASE OF SPOROTRICHOSIS*

By C. M. Grigsby, M.D., F.A.C.P.,
Professor of Medicine, Baylor University,
and
Ramsay H. Moore, M.D.,
Instructor of Clinical Medicine, Baylor University,
Dallas, Tex.

Within the past few years quite a number of cases of sporotrichosis have been reported through the various journals. This disease, however, still remains in the group of the less common ones. We believe this case will prove of interest not only for its rarity, but also for the resistance it offered to the most intensive and extensive treatment.

Sporotrichosis is a chronic infection characterized by both internal and cutaneous lesions and caused by one of the various forms of the parasitic fungi of the sporotrichosis group. There are four clinical forms:

(1) Disseminated gummatous form characterized by small firm nodules which break down.

(2) The ulcerative type resembling tuberculous cutis.

(3) The localized type which resembles a large gumma.

(4) The extra-cutaneous forms: ulcerous lesions of mucous membranes, osteomyelitis, etc.

Our case fell in types two, three, and four.

The differential diagnosis lies mainly between tuberculous cutis, syphilis and the mycosis. The diagnosis is made by bacteriological examination of the contents of the lesions.

In reviewing the literature for the past four or five years we find that deRezendc[1] described four cases in Brazil in which he got wonderful results by the use of mercuric chlorid locally; Schulmann and Mason[2] report a case involving the lungs and state that only five such cases are on record; J. J. Moore[3] mentions a case following the bite of a field mouse; and Lane[5] reports five cases which were apparently contracted from close contact with animals. Brainos[6 8] describes two cases involving the testes which looked very much like gummata; Eisenstadt[4] reports in detail a case resembling tuberculous cutis; and Moure[7] emphasizes the fact that surgical interference is probably not the best mode of attack and advises very strongly against it.

CASE REPORT

The patient is a white man, a farmer, age 55 years, married and lives in Oklahoma. His chief complaint is pain and swelling over the sternum and an open sore on the right thigh.

Past History.—The family history is negative throughout. One boy is living and well. Childhood history is negative except for the usual childhood diseases. His habits are good. He de-

*Read in Section on Medicine, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark, Nov. 14-17, 1921.

nies all venereal infections. His past health has been excellent.

Present History.—This trouble began in June, 1920, with pain in his chest which seemed to localize about the middle of his sternum. The pain was dull aching in type and did not radiate. It was constant and grew progressively worse. A few days later he noticed a small red area on his chest about where the pain was worst and this red area began to swell and become very tender to touch. At the same time he noticed a small area about the size of a half dollar on his right thigh and this area soon broke down and left a dirty-looking ulcer. Other symptoms accompanying were as follows: headache, malaise, loss of weight, slight cough but usually non-productive, anorexia, impaired digestion, constipation, occasional night sweats, and an afternoon elevation of temperature. The swelling of the chest wall increased in size and became very painful.

Physical Examination.—On general examination he was seen to be apparently fifty-five or sixty, rather dull, emaciated and slightly anemic. His temperature was 99; pulse, 70; looks toxic, skin moist, and no deformities were detected.

Head and Neck.—There is a small ulcerative area on the right side of the neck. The ulcer is dirty and necrotic and seems to extend into the lymph glands.

Respiratory System.—There is a rather marked emaciation. Respiratory movement is full and even. Just over the mid-sternum is an elevated inflamed area about four inches in diameter and shows redness and slight induration, but no fluctuation. This area is quite painful to touch. Breath sounds come through distinctly, but there are a few moist rales to be heard all around the inflamed area.

Cardio-Vascular.—Apparently normal. Blood pressure 120/65.

Gastro-Intestinal.—Negative.

Genito-Urinary and Rectum.—Negative.

Nervous System.—Negative

Lymphatic System.—The inguinal glands are palpable on the right side.

Extremities and Skin.—There is a small ulceration about the size of a half dollar on the lateral surface of the right thigh. Its edges are well defined and its base is dirty and necrotic. The right elbow joint shows some redness and swelling. It is painful, but there is no fluctuation.

Laboratory Findings.—The sputum is blood-streaked but negative for tuberculosis.

Urine has been negative on several occasions.

Feces are negative.

Blood shows Hb. 70 per cent; R. B. C., 3,610,000; W. B. C., 12,000; differential normal; and negative for malaria.

Blood Wassermann is negative.

X-Ray.—Fluoroscope shows anterior and posterior mediastinum clear and normal. Heart and aorta appeared normal. An x-ray plate of the chest is normal.

The bacteriological report of Dr. W. H. Moursund is as follows:

Examination of the Ulcer on Right Thigh.—The first intimation as to the probable bacteriology in this case was obtained from direct smears made from the ulcer of the skin from the thigh. In these smears a long branching, thread-like, acid-fast organism was demonstrated. This organism was found to occur more or less in masses, consisting in some instances of two or three threads, in other instances of many threads. The threads showed true branching, but no spores were found. A very interesting fact was the absence of the other organisms in the smears. Pure cultures were obtained on plain slant agar from the ulcer.

Pus from Abscess in Chest Wall.—The same organism as described above was demonstrated in direct smears and in cultures made from the pus. The organism was obtained in pure culture. No granules were found either macroscopically or microscopically.

Material from Elbow Joint.—Apparently it consisted of blood. Direct smears from this did not show any organisms. Cultures on potato after 48 hours' incubation showed pure culture of the same organism as isolated from the ulcer on the thigh and from the abscess in the chest.

Discharge from the Lesion on the Neck.—In direct smears and cultures the organism described above was demonstrated.

DESCRIPTION OF THE ORGANISM

Morphology.—This varies considerably. In the direct smears from the above lesions the organism appears as a long, thread-like filament showing true branching. In some of the threads divisions can be made out giving the thread the appearance of hyphae of mycelium. The ends of the threads are not enlarged nor are the spores visible in or on the organism as found in the direct smears from the lesions. Smears made from the cultures show marked difference in the morphology and this differs also, depending upon the character of the culture medium. The organism shows marked fermentation, especially on solid culture media. Bacillus-like bodies of various lengths, oval bodies of different diameters, of which some no doubt are spores, are seen in the smears. The rod-shaped fragments predominate. Some of the threads have a beaded appearance. The morphology of the organism does not vary so greatly when it is grown on fluid media as when on solid media, though a typical colony removed from the fluid medium sometimes shows nothing but fragmentation forms.

Staining.—The organism stains fairly easily, but more intensely with acid dyes than with alkalies. When the organism occurs in its typical form, i. e., the thread-like form, it stains with Gram's method; however, the fragmentation forms may stain partly Gram-positive and partly Gram-negative. The thread-like forms and some of the other forms are acid-fast, but at times a smear showing altogether fragmentation forms will show only a few that are acid-fast.

Culture Characteristics.—The organism can be cultivated on any of the ordinary culture media. It grows fairly readily after once becoming established. In the original cultures the growth was not visible until after 72 hours' incubation. Frequent transplantation increases its rapidity

of growth. The organism remains alive in culture tubes for several weeks. It has been recovered from tubes in which the media has completely dried. It is a strict aerobe, sporogenous, non-liquefying, non-aerogenic, non-motile chromogenic organism. Pigment production was first noticed on one of the potato tubes after the sixth day. This has also been demonstrated on plain slant agar. A pink color is produced. Surface growths on the solid media are white, dry, heaped-up and wrinkled. As to color, the appearance can be compared to that of a freshly whitewashed surface until the pink pigment is produced. No indol is produced in Dunham's peptone. No acid or gas is produced in either saccharose, dextrose or lactose bouillon. There is no turbidity produced in either of the fermentation tubes. The colonies appear as discrete white masses resembling fairly round pieces of white chalk. The growth is most marked on the surface of the medium, but at times colonies may be seen attached to the surface of the tube for a short distance below the surface of the medium. The growth is apparently more profuse in saccharose bouillon than in lactose or dextrose. More profuse growth is obtained on glycerin agar than on plain agar. No change is produced in litmus milk. The organism resists drying and heat to a very marked degree.

Diagnosis.—Sporotrichosis, possibly sporothrix of Schenckii.

TREATMENT AND NOTES ON THE CASE

The first treatment consisted of sodium cacodylate gr. 5 intramuscularly every other day; potassium iodid gr. 20 and bichlorid of mercury gr. 1124, by mouth, three times a day. He was put on a highly nutritious diet, kept in bed and given analgesics as needed for pain. He also had a simple cough mixture as needed. He seemed to improve on this treatment, though he continued to run a slight temperature in the afternoon. Soon the mass on his sternum showed fluctuation and broke through, draining a thin, yellow pus. The organism as described was obtained in pure culture. The open wound on his side was treated with iodin and glycerin and dressed twice a day. This treatment was kept up for a month and the improvement seemed so slow that we decided to try some light x-ray exposures. This was done. He was given some three or four exposures, and we are of the opinion that it did more harm than good. At any rate, the exposures were stopped on the advice of the roentgenologist. The sodium cacodylate was stopped, but large doses of potassium iodid were continued. Eight weeks later the patient showed very little improvement. He was beginning to increase in weight and his blood picture looked better, but the lesions were practically unchanged. His elbow was quite large and painful. His chest lesion was still draining and in the meantime the upper cervical glands on the right showed involvement. The chest wound was curetted thoroughly and packed daily with iodoform gauze and an autogenous vaccine was made. It was very difficult to sterilize the vaccine after we had it in solution. The organism is a spore former and complete sterilization was next to impossible. The vaccine was given in increasing doses every other day, but without reaction or any noticeable improvement. He had, however, only seven or eight doses.

We then decided to try giving a few doses of neo-arsphenamin. A 0.6 gram dose was given and a severe systemic reaction followed with the appearance of albumin and a few casts in his urine, so we discontinued this medication. The potassium iodid was kept up all of this time in full doses.

Some four months later one of the surgeons thought it wise to open up the elbow joint, clean it out and try to get an ankylosis. This was done, and we found that the whole upper end of the ulna and radius and the lower end of the humerus were almost totally destroyed. A month after the operation the joint seemed to be fixed, but soon it broke down and began to drain again. The surgeon this time decided to amputate high up despite the fact that many authors advise against surgical interference. The arm was taken off, healing occurred slowly and it has remained in good condition for the past four to six months. This left the superficial chest lesion still draining.

Many ointments, etc., were tried on this ulcer, but seemed to help very little. Finally silver nitrate in 10 per cent solution was tried. The wound was cleaned every other day for a while and the silver nitrate applied and healing soon became quite noticeable. At present the chest skin lesion is practically well and the patient is in good physical condition and able to do a one-armed man's work.

CONCLUSIONS AS TO TREATMENT

I do not believe any of the drugs we used were at all specific for the internal or pulmonary infection and that the rest tonics and high diet put him in shape to whip it out. X-ray, vaccine, neo-arsphenamin, potassium iodid, mercury and arsenic were all of very little use. Silver nitrate in 10 or 15 per cent solution applied often to the skin lesion was most helpful of all.

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DISCUSSION

Dr. George Dock, St. Louis, Mo.—Diseases of the kind represented by this group of organisms at the present time are perhaps more frequently misdiagnosed than they were a few years ago. Since the advent of serological tests and tubercu-

lin tests many people with lesions like these immediately start in with the Wassermann test, tuberculin reactions and things of that kind. You see how much better it is to make a direct examination of the material, and I am particularly interested in the good results from examination of smears. That is a thing I wish to lay particular stress upon, namely, to get smears, not those sent from a distance, but taken from material that we know something about.

I was interested in seeing apparently negative results from what after all was thorough treatment. When we remember how sensitive many of these organisms are to iodids alone, the question comes up whether it does any good to add a lot of other antiseptics at the same time. It is not a bad rule in treating imperfectly known parasitic diseases to use one poison at a time. Such a patient should be treated with iodids at first because it is the most promising thing to do, and this should not be stopped until a very thorough trial has been made. If that fails, and it will fail in some cases, other agents can be used. This might apply in so common a disease as syphilis. It is better to give one or two things intensely at a time, rather than mix the patient up with various poisons.

Dr. William Litterer, Nashville, Tenn.—Sporotrichosis is a comparatively rare and widely distributed condition. It has been stated by Hamberger that it is found in every part of the world, but only in a few isolated sections. He also states that seven-eighths of all cases occur in the Mississippi Basin.

I saw a case which was referred to me a number of years ago from Chattanooga in which on a direct smear the spores were easily found, but there were no mycelial threads or filaments as described in Dr. Grigsby's paper. All observers state that they find the spores and not the mycelial or filamentous threads.

This disease may be more common than reported cases would indicate, since it may be mistaken for many other affections, such as gummatous, tuberculous, cancerous and many other pyogenic conditions. Under ordinary routine treatment with iodid of potassium, cases of sporotrichosis recover readily. Again many patients treat themselves by taking patent medicines, many of which contain a good percentage of potassium iodid.

During this summer I undertook investigations in quite a number of cases of skin cancers, lupus, gummatous and pyogenic conditions, making direct smears and cultures from each. In one case of tuberculosis of the skin I was able to demonstrate many spores which were identical with the spores of sporotrichosis.

Cultures responded somewhat closely to the organism of Schenck, but they were non-pathogenic to animals. Repeated cultures and animal inoculations with large doses failed to kill animals. From this I concluded that we may meet a non-pathogenic sporothrix organism and hence be misled with the diagnosis of sporotrichosis by simply finding the spores by direct smear. It is necessary not only to make a direct smear, but to culture and even resort to animal inoculations in order to make a definite diagnosis of sporotrichosis.

This case in question resembled clinically a case of sporotrichosis, but further tests revealed the tubercle bacilli in direct smears and in tissue sections. This is the first case, so far as I have been able to find in the literature, where a non-pathogenic streptothrix has been found associated with tuberculosis of the skin. I shall continue to make further investigations of all ulcers to see if there may not be more of these non-pathogenic micro-organisms.

Dr. L. F. Barker, Baltimore, Md.—Sporotrichosis is another disease for which America can claim credit for the discovery of the causative micro-organism. I remember the case in which the fungus was isolated. It was observed and reported in 1898 by Dr. B. R. Schenck, then an assistant in the Johns Hopkins Hospital. The organism at Dr. Schenck's request was studied and classified by Dr. Smith (of the Bureau of Agriculture in Washington), who named it Sporothrix Schenckii. Two years later Hektoen and Perkins described certain refractory abscesses due to the same or to a closely related fungus. The disease seemed to receive little attention until, a few years later, reports of sporotrichosis were made by two French observers, de Beurmann and Gougerot, who described the disease apparently independently of Schenck. It is now generally known, however, that Schenck deserves priority for the discovery of the disease and its causative agent.

This disease is met with more frequently in surgical wards than in medical wards. Possibly, for that reason, it is overlooked a little too often. Owing to pressure of work, surgeons are not always able to make such thorough general diagnostic surveys of their patients as medical men have become accustomed to in the medical wards.

The disease is most often mistaken for syphilis; and, indeed, the lesions may resemble very closely those of syphilis, especially gummata. Sometimes there may be a confusion of blastomycosis with streptotrichosis, or with tuberculosis, but less often than with syphilis.

The drug iodid of potassium usually acts as a specific in sporotrichosis. Not infrequently the lesions clear up quickly under massive doses of iodid of potassium, and I should be inclined in a refractory case to try big doses over a considerable period before resorting to surgery or to other therapy. Iodid of potassium will, in the majority of cases, effect a cure.

Dr. Grigsby (closing).—This man was a farmer and closely associated with horses and cattle, and the lesions looked like syphilis. We both thought that was what the man had, although he gave no history of syphilis or of venereal lesions. Inasmuch as we thought it was syphilis, we had a Wassermann test made, and that was negative. Then we studied smears of the ulcers on his thigh and pus from the chest, and in that way the diagnosis was made.

Note.—I saw this man on June 29, 1922, and he is working as night watchman and looks well.

TARTAR EMETIC IN THE TREATMENT OF GRANULOMA INGUINALE AND OTHER GRANULOMATA AND GRANULATING ULCERS*

By Kenneth M. Lynch, M.D.,
Dallas, Tex.

Within this year I have had the privilege of reporting[1] a number of cases of granuloma inguinale in which, after various unsuccessful treatments, good results were being obtained from intravenous injections of tartar emetic.

These cases were divided into two broad groups, pure cases, i. e., those apparently unassociated with other diseases, and complicated cases which had at the time some associated disease which complicated the clinical picture and interfered with treatment.

In the first group there was at the time of the report one case which was of long duration and very extensive lesion which was not completely recovered at the time of reporting. I wish to complete the report of this case, as it is to me the most encouraging of the series from the standpoint of results obtained.

This patient (Case No. 3 of the reported series) was a young negro woman who had been bedridden for more than a year and was near exhaustion from a granuloma (see Fig. 1) which began more than two years previously as a papule in the perineum and had extended around the anus and up over the whole genital region even on to the lower abdominal wall. Intravenous injections of antimony and potassium tartrate were carried out over a period of three months before the case was pronounced well. During this time she had thirty injections of one per cent solution, aggregating 272 m. l. or 2.72 grams of the drug. During the first few weeks of this course very little improvement took place, and had it not been for the fact that two other less extensive cases recovered during this time on the same treatment the case would undoubtedly have been abandoned and the drug pronounced of no effect. However, perseverance was rewarded by a decided change in the lesion by about the sixth week and then a gradual improvement with rapid progress to complete healing in the last three weeks. The photograph of the case here shown was taken at the time that improvement became evident and shows marked regression of the lesion around the perineum with the appearance of islands of new epithelium over the upper part, although the lesion still appeared very extensive at that time. At the time that this local improvement became evident her general condition also began to improve. She lost her fever, gained weight rapidly, became cheerful, and was up at work three weeks before healing was complete. The new surface was hairless, nonpigmented and grossly rough, but was assuming color and becoming smooth, although still hairless at the time of dismissal of the patient.

The undoubted cure of this extensive case by persistent treatment is a source of great encouragement, particularly since I had been led by previous reports to expect little benefit even from the tartar emetic in such an extreme case. I am inclined to think that such previously reported incurable cases were either complicated or the treatment was discontinued too early.

The other case of this series, the report of which I wish to complete, is illustrative of the second group, i. e., granuloma inguinale associated with other disease (in this case syphilis and gonorrhea), and also points to the effectiveness of a combination of tartar emetic and arsphenamin in such cases. Before this case and at the same time, I had several cases of associated syphilis and granuloma inguinale, some of which were given anti-syphilitic treatment and some antimony and potassium tartrate with very discouraging results. Benefiting by experience in these previous cases, the one under present consideration was given both treatments at the same time, i. e., the tartar emetic injections were given between the arsphenamin injections. From this course a very prompt response was obtained and after six weeks, during which time she had taken twelve doses of 1 per cent tartar emetic aggregating 112 m. l. and also three arsphenamin injections, she was discharged cured of the granulomas. This was Case No. 8 of the reported series (see Fig. 2), a negro woman, aged nineteen, whose Wassermann reaction was 4-plus and who had active gonorrhea at the time. The duration of the granulomas previous to treatment was three months, the first beginning in the perineum and a month later extension occurring on what were apparently ruptured buboes in both groins.

The majority of cases of granuloma which I have seen belong to this group, associated with syphilis, which is undoubtedly the reason why they have previously

*Read in the Section on Medicine, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

been considered syphilitic granulomas and also why anti-syphilitic treatment failed to affect them. I am of the belief that this is the larger group, and the combination will explain reports of granuloma inguinale incurable by tartar emetic and also many cases of syphilis in which granulomas have been unaffected by anti-syphilitic treatment. Granulomata, especially in the region of the external genitalia, occurring in syphilis should be searched for Donovan's organism. The combined treatment offers relief in otherwise very obstinate or incurable conditions.

Intravenous injections of antimony and potassium tartrate have now been given with beneficial results in several quite different infections, including Leishmaniasis

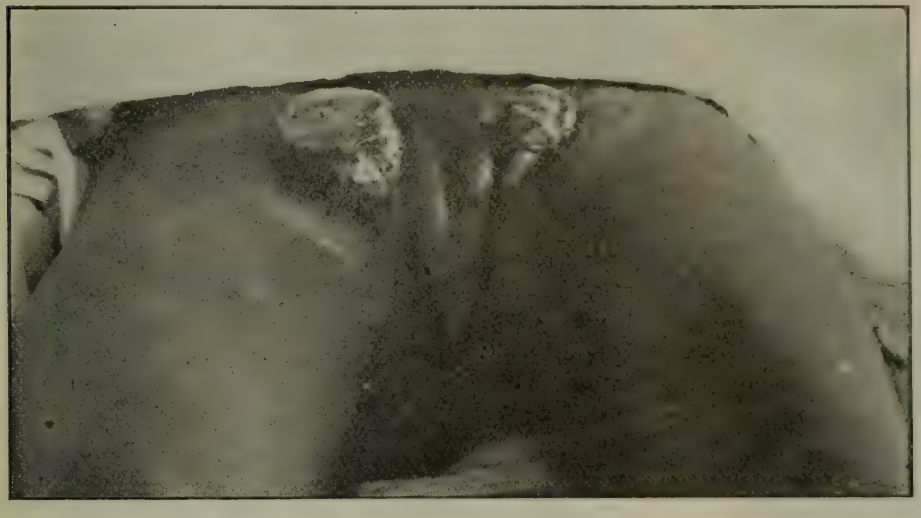

Fig. 2.—Granuloma Inguinale

or kala-azar, Bilharziasis, blastomycosis, granuloma inguinale, a number of tropical ulcers of undetermined origin, and even in leprosy. It is generally considered, I believe, that the antimony is the active factor and other antimony preparations have been administered with equally good results in some instances. Such diversified activity of this substance seems to call for further pharmacologic study and further investigation of its value in other infections, particularly of the classes in which it has already given service. I have used it only in the form of 1 per cent solution of the commercial tartar emetic (antimony and potassium tartrate U.S.P.) in either physiologic salt solution or distilled water sterilized by filtration. The usual course pursued has been to start with 2 m. l. in 10 m. l. of salt solution and increase the dose by 2 m. l. every second or third day up to 12 m. l. Some nausea has been encountered at this dose and it may have to be decreased. Care should be exercised to allow none to escape into the tissues at injection as it sets up a violent local reaction which may give considerable trouble.

It seems that the drug leads to an early destruction of the organism of Donovan in granuloma inguinale since in those cases in which I have observed the organism during the treatment its numbers have been affected very early. After the second or third dose disintegration of the organisms in the large mononuclear cells has been plainly evident, with apparent disappearance at about the end of two weeks or after the fourth or fifth dose. After the disappearance of the typical intracellular forms there remains practically up to completion of the healing an organism about whose relationship to the condition I am uncertain.

TARTAR EMETIC IN GRANULATING ULCERS OF UNKNOWN ORIGIN

At the time these cases of granuloma inguinale were under treatment I also had three cases of unyielding chronic ulcer which were subjected to similar procedures with rather interesting results.

The first of these cases (see Fig 3) was a negro woman, aged forty, a midwife, who said that a month previously the toes of her right foot began to swell and give some pain. About a week later some blisters formed on the dorsum of the foot, from which developed two ulcers. Her Wassermann reaction was negative. One of the ulcers was about the size of a dollar, the other about half that size, both with rounded indurated edges and granular firm red bases. Bacteriologic examination of these ulcers revealed nothing of any significance, but a bacillus closely resembling the organism previously mentioned as persistent in granuloma inguinale after the characteristic Donovan organism had disappeared. It is of interest to note that this bacillus in culture when injected subcutaneously in a rabbit led to the development of a granulating ulcer of from several weeks to three months duration, this experimental condition being virtually the same as occurred from cultures obtained from granuloma inguinale.

This woman had been in bed and under various treatments for several weeks. She was given

seven injections of tartar emetic, aggregating 49 m. l., in a period of seventeen days. Improvement began after the second or third dose and progressed favorably until at the end of the seventeen days the smaller ulcer was completely healed, the larger was the size of a dime and only skin deep, the swelling of the foot had subsided and she was using it as normally.

The next of these cases was a young negro woman in good general condition and with a negative Wassermann reaction. About a year previously she scratched her leg on a wire in the yard. Some blisters formed along the line of the wire scratch, and these broke down and coalesced to form an unyielding progressive ulcer. This ulcer was then about 4x5 inches in diameter, about midway between the knee and ankle, had a fungoid granular red base which bled easily, with broad

Fig. 1.—Granuloma Inguinale

indurated darkly pigmented edges (see Fig. 4). This ulcer was completely excised and the wound sealed under some kind of a paste. In the excised portion I was unable to find anything more than granulation tissue and a bacillus resembling that obtained from the foot just described. On account of the nature of the lesion and the history of its development I made a particular but unsuccessful search for fungi and protozoa. The only result of the surgical treatment was a larger ulcer. After a month, at which time the ulcer had noticeably extended, she was started on tartar emetic, receiving sixteen doses aggregating 154 m. l., over a period of six weeks. After two weeks improvement was noticeable, and at the time of discharge the ulcer was about 1½ inches in diameter.

The third case of this group was a white woman, aged thirty-six years, with a negative Wassermann reaction. Twelve years ago she struck her right leg on a stump. From this a sore developed and had never healed. The ulcer in this case resembled very closely that in the preceding case, but was more indolent and somewhat larger. Examination of the ulcer revealed nothing more than a bacillus resembling that from the other cases. The ulcer in this case was thoroughly curetted and the woman then received ten doses of tartar emetic aggregating 108 m. l., after which I lost sight of her. During the course of treatment the ulcer had granulated to the surface level and the edges had been covered by epithelium over three-fourths of an inch.

Fig. 3.—Ulcers of Foot

I report these three cases because they failed to improve before the tartar emetic administration and did improve very materially under it. What the nature of any one was and whether the organism found in all three was of any importance I do not know.

In this connection I wish to call attention to a report by Sen Gupta[2] on the treat-

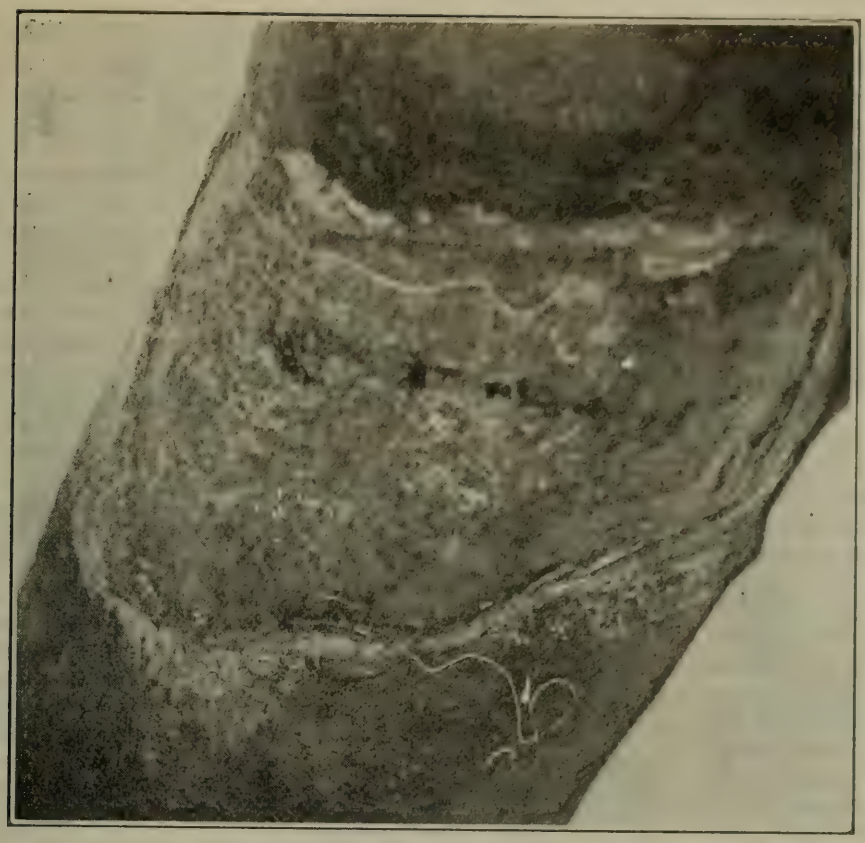

Fig. 4.—Ulcer of the Leg

ment of cachar sore by tartar emetic, cachar sore being an unyielding ulcer usually of the leg, but sometimes of the lip or nose, affecting cultivators of tea or tea garden coolies. In these sores was found an unknown bacillus in enormous numbers, but no other organism. Several of these cases which had extended in the face of various treatments over several months recovered completely within three or four weeks on 2 to 4 m. l. doses given once a week.

One would naturally think of such cases as these cachar sores and the two leg ulcers here reported as being most probably of fungus origin and it may be that tartar emetic and other antimony preparations have a wider application in fungus infections than has yet been determined. At any rate antimony should be given a trial against the various members of this class of infections.

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DISCUSSION

Dr. John A. Lanford, New Orleans, La.—The subject of tropical ulcers, sometimes spoken of as granuloma inguinale or diffuse granuloma inguinale, has received considerable stimulation in the last few months, brought about first by the publication by Symmers, of New York, and later by the contributions Dr. Lynch made last year. They have directed the attention of the medical profession to those chronic, serpiginous granulating ulcers of the genitalia which have heretofore been classified as chancroid, but which do not respond to the usual treatment for that condition.

Recently we have observed a number of these cases in the outpatient department of Touro Infirmary. Since last March we have had 18 cases, 15 of which passed through the genito-urinary division under the immediate supervision of Drs. Reed and Wolfe, and three through the surgical division under the care of Dr. Mims Gage. These cases have been worked up by the several men mentioned and the diagnosis confirmed by the finding of the specific organism. They have followed rather closely the treatment as outlined by Aragao and Vianna with the injection intravenously of 1 per cent solution of tartar emetic, in increasing amounts, and the results have been striking and uniformly satisfactory in uncomplicated cases. The treatment has extended over a period of from three to four or five months, and the actual quantity injected has varied from 15 to 100 c. c. There have been only a few unfavorable symptoms, such as diarrhea and general discomfort following the larger doses. The cases treated have cleared up rather quickly, but cessation of the injections for a period of time has been followed occasionally by a recurrence of lesions.

There is one point about the condition that I would like to emphasize, and that is the multiplicity of the lesions at times. The infection does not spread through the blood stream or the lymph stream, but following auto-inoculation we find the lesions in different parts of the body. In the majority of instances the disease is localized, confined entirely to the genitalia, but we have several cases in New Orleans in which the neck, mouth, gums and tongue were involved and in which the specific organism has been found in all lesions.

I recall one instance that illustrates the chronicity of the condition, the multiplicity of the lesions, as well as the doubtful diagnoses that have been made. The patient was a young negro, about thirty years of age, who had been complaining for three or four years. During that time he saw many physicians and was subjected to many different treatments, both medical and surgical. Even amputation of the penis was done for a granulating ulcer which would not heal. At the time of the amputation of the penis a suprapubic cystotomy was performed, and later on skin grafting was resorted to in order to cover the destroyed tissue in the genitalia. When he presented himself to the clinic at Touro Infirmary he had a large granulating lesion on his thigh, corresponding to the area where the skin for the graft was obtained, measuring at least ten inches long by six inches wide. He had a lesion on his abdomen in-

volving the suprapubic region; and the remains of his penis, the scrotum and perineum extending up into his rectum presented a raw granulating surface. The injection of tartar emetic quickly made the man feel better. After a period of six weeks he was able to resume his occupation and is now apparently well.

While tartar emetic is a specific for this condition, so far as the active lesions are concerned, it must be persisted in after the lesions have disappeared, for the reason that there may be a recurrence later on. But where elephantiasis has occurred in the scrotum or penis, the treatment will only relieve the active skin lesion.

Dr. J. C. Michael, Houston, Tex.—Very recently I have had occasion to see three cases of ulcers of unknown etiology which are still under observation, so recently that the work on them is not completed. Two patients were robust negro men in the early twenties. In one an ulcer was present on the right leg extending from the lower third of the leg to the popliteal space. It has been present for eight years. The other has had a similar lesion for two years; and in a young white boy an ulcer the size of a dollar has been present for six months. In each of these cases the ulcers developed following traumatism. They have been subjected to numerous therapeutic measures, antispecific and otherwise. In none of those cases was the Wassermann positive, and in none have I been able to determine any fungus infection. In none of these cases have I used tartar emetic because I have been unable to demonstrate the Donovan organism, but I am hoping that I shall be able to do so.

Dr. Lynch's work and that of others along the same line have shown there is a group of these cases which is amenable to therapy, but which previously has been very obstinate to treatment, and which undoubtedly is far from being a rare condition in the Southern states.

Dr. Marcus Haase, Memphis, Tenn.—Yesterday I heard a paper upon the etiology of phagedenic ulcer and granuloma inguinale, and I am in doubt whether or not the author wished to convey the impression that there was no relationship between granuloma inguinale and phagedenic ulcer. To my mind granuloma inguinale is a distinct dermatological entity and has no relation to phagedenic ulceration. The condition now under discussion is called in the text books granuloma inguinale tropicum, or ulcerative granuloma pudendum. It is not limited to the pudendum nor is it a true ulcerative process. Primarily it is a distinct granulomatous condition. So I object to the word granuloma inguinale, as it does not always convey a correct title to the disease. This condition, as was mentioned this morning, may occur on other parts of the body by auto-inoculation.

Recently in the General Hospital in Memphis a number of cases have been called granuloma inguinale, but upon closer study they proved to be nothing more than cases of phagedenic ulceration.

Dr. M. D. Levy, Galveston, Tex.—Some work was carried out by the Department of Biochemistry at Galveston in producing nephritis in rabbits, which suggests a point in the treatment of granulomatous condition.

We selected six individuals in the clinics with no granulomatous lesions, so that they served as a pretty good guide as to the effect of the treatment: a case of portal cirrhosis, a case of ordinary hemiplegia from hypertension, a luetic hemiplegia, two cases of paresis, and one case of feeble-mindedness. These patients were given a 2 per cent solution of tartar emetic intravenously every second day, starting with 0.5 c. c. and working up to 5 c. c. A complete blood analysis for all of the non-protein nitrogen elements of the blood was made at the beginning and end of the treatment. Only one of these patients showed any increase above normal at the time we started, the case of paresis with marked hypertension. Three cases showed an increase of non-protein nitrogen at the end of a week up to 50 milligrams, and one an increase to 120 milligrams, 55.5 milligrams urea being obtained in this case. The tolerance in these individuals to tartar emetic did not enter into the increased amount of the non-protein elements. In only one of these cases was there any vomiting or nausea following the administration. He showed the least increase in the non-protein elements of all these cases, with no other effect of the drug noted. One case of feeble-mindedness was given 7 c. c. intravenously, and so far as the effect was concerned, it was like giving him so much water. We noted absolutely no change in one case of paresis, nor in the blood chemistry of a case of portal cirrhosis. At the present time with the general application of this drug, to report these findings is of some interest.

Dr. Lynch (closing).—I hope Dr. Levy will continue his work and determine whether there is danger in the drug. It would be well also to determine in that connection whether the other antimony preparations, which may be used with apparently as good results, are also deleterious, especially to the kidneys.

DIRECT EXPOSURE TO TUBERCULOSIS IN INFANCY AND CHILDHOOD AND ITS RELATION TO MANIFEST PULMONARY TUBERCULOSIS IN THE ADULT*

By W. M. Taylor, M.D.,
and
L. J. Moorman, M.D.,
Oklahoma City, Okla.

As a result of tuberculin tests, x-ray studies and post-mortem findings, it has been proven that childhood infection with the tubercle bacillus is almost universal. This conclusion naturally led to a study of immunity and the relation of childhood infection to pulmonary tuberculosis in adult life. Despite all the facts we have been able to gather by means of clinical, laboratory and exper-

*Read in Section on Pediatrics, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

imental studies, we are still unable to be dogmatic with reference to these complex questions, and it is with the hope of contributing something toward their solution that we offer the data given below, which has been gathered from our office and dispensary records.

Krause[1] states that about 10 per cent of children show infection at two years of age; 25 to 30 per cent at four years of age; 50 per cent at ten years of age; and 60 to 75 per cent at fifteen years.

In a series of post-mortem examinations in children Opie[2] found tubercle in 9.3 per cent under one year of age; 6.2 per cent from one to two years; 42.8 per cent from two to five years; 45.5 per cent from five to ten years; and 66.7 per cent from ten to eighteen years.

It is quite natural to think that these children who are in direct contact with open cases day after day will show more evidence of infection than those who have no known exposure. If there is such a thing as massive infection it must occur most frequently in contact cases. In view of the fact that physical signs of tuberculosis are rare in childhood and their proper interpretation difficult, and taking into consideration the fact that tuberculin tests do not indicate the degree of infection, we have depended upon x-ray findings in attempting to determine the degree of infection or the extent of involvement in the children reported below.

In this study we have considered the small calcified areas in the hilum shadows and in the parenchyma of the lung as indicative of a tuberculous process. Krause, Wolbauch, Reynolds and many others believe that calcification means tuberculosis with possibly very few exceptions.

In autopsy studies of fifty adults in which the x-ray was employed for the purpose of locating the tuberculous lesions, Opie[3] found tuberculous infection in 100 per cent. The following is quoted from his report:

"The use of x-ray plates made from the lungs has proven an efficient means of determining the presence of healed tuberculous lesions within the substance of the organs. Since calcium salts are impervious to the x-rays, very small calcified nodules may be readily identified in the plate. Partially calcified foci containing caseous material of soft friable consistence are conspicuous in x-ray plates. Search for tuberculous lesions has been made in the lung hardened in formalin, and as far as necessary, cut in sections. The difficulty in finding a nodule well depicted in the plate has often been great, and in a number of instances no lesions would have been found without the aid of the plate. In one instance a small intrapulmonary nodule obvious in the plate was long sought by careful palpation of sections of 0.5 to 1 cm. in thickness, and finally found within an angle at the bifurcation of a bronchus of medium size."

In discussing diagnosis, Brown[4] says the tuberculin test has been used less and less and refers to the importance of the roentgen ray, especially in the diagnosis of early or minimal cases.

We have tried to determine the degree of infection by the density and extent of the hilum and peribronchial shadows and the number and size of calcified nodules and have accordingly classified our cases as heavy, moderate and light. In employing the term massive infection we prefer to think of it as meaning the summation of oft-repeated doses of tubercle bacilli rather than the reception of a single massive dose. By direct contact we mean the daily association of the individual with an open case of tuberculosis, not necessarily a member of the family. By contact with a suspected case we mean association with one who bears certain marks of tuberculosis, but in whom the diagnosis has not been confirmed by the discovery of tubercle bacilli in the sputum.

This analysis of cases embraces 223 children under sixteen years of age. Of the 223 cases studied, 28 were under six years of age; 11 of these were direct contact cases; 13 were exposed to suspected cases; and 4 gave no history of contact.

The x-ray findings in this group were as follows: of the 11 direct contact cases, 7 were heavy; 3 were moderate; and 1 was light. Of the 13 exposed to suspected cases, 2 were heavy; 8 were moderate; and 3 were light. Of the 4 cases with no history of contact, all were light. (See Table, Group 1.)

Ninety-two of the total number of cases studied were from five to ten years

of age. Of this number 51 were direct contact cases, 21 were exposed to suspected cases, and 20 gave no history of exposure. Of the 51 known contact cases, 24 were heavy; 23 were moderate; and 4 were light. Of the 21 exposed to suspected cases, 10 were heavy; 7 were moderate; and 4 were light. Of the 20 with no history of exposure, 8 were heavy; 7 were moderate; and 5 were light. (See Table, Group 2.)

One hundred and three of the total number were between ten and fifteen years of age. Fifty-seven of these were direct contact cases; 23 were exposed to suspected cases; and 23 gave no history of exposure. Of the 57 known contact cases, 33 were heavy; 17 were moderate; and 7 were light. Of the 23 exposed to suspected cases, 12 were heavy; 7 were moderate; and 4 were light. Of the 23 with no history of exposure, 12 were heavy; 8 were moderate; and 3 were light. (See Table, Group 3.)

In the two latter groups, embracing that period of life between five and fifteen years, we find increasing evidence in favor of Krause's theory that when the child begins to make contact with the outside world, the opportunities for infection are correspondingly multiplied. This is shown in the rapidly increasing percentage of heavy and moderate infection in the groups with no history of direct contact. There is also an argument here in favor of massive or gross infection by means of oft-repeated small doses as indicated by the rapid increase in the percentage of heavy and moderate infection in Groups 2 and 3 among those who give no history of direct contact.

To summarize, we have 223 children under sixteen years of age. One hundred and nineteen gave a history of direct contact. Of these, 64, or 53.8 per cent, showed heavy infection; 43, or 36.2 per cent, showed moderate infection; and 12, or 10.8 per cent, showed light infection. Of the total number, 57 were exposed to suspected cases; 24, or 42.1 per cent, of these were heavy; 22, or 38.5 per cent, were moderate; and 11, or 19.4 per cent, were light. Forty-seven of the total number gave no history of exposure; 20, or 42.5 per cent, of these were heavy; 15, or 31.9 per cent, were moderate; and 12, or 25.5 per cent, were light.

This analysis of cases indicates that the more intimate and direct the contact in childhood the more massive the infection, and that contact with the outside world as the child grows older seems materially to increase the degree of infection in those without known contact. Attention should be called to the fact that these histories were taken by dispensary nurses, and for want of time and special training in history taking it is possible that many cases giving no history of contact, with thorough investigation, might be placed in the contact group. All the contact cases were x-rayed regardless of the symptoms or physical condition, while cases exposed to suspects and those giving no history of contact were x-rayed only when they proved to be substandard in weight or in general appearance or when they presented symptoms of toxemia or physical signs in the chest. This makes the comparison between the contact and the non-contact groups of less value than if the members of the latter groups were apparently normal instead of always subnormal.

With these figures with reference to childhood infection before us, we now turn to a discussion of pulmonary tuberculosis in adult life and its relation to childhood infection with special reference to direct contact in childhood. For the purpose of this study, we have reviewed the histories of 100 adult cases of advanced and moderately advanced pulmonary tuberculosis as they were examined by one of us in routine office practice, and 100 similar adult cases examined in the Oklahoma City Tuberculosis Dispensary. Sixty-seven per cent of the office cases and 57 per cent of the dispensary cases gave a history of childhood exposure. This discrepancy in percentage might be accounted for by the fact that the office cases are of a higher average intelligence and that the office histories may have been more carefully taken. We find a history of childhood exposure in 62 per cent of the 200

adult cases studied. Considering the fact that this investigation was not anticipated when the histories were taken and keeping in mind all the obstacles which may stand in the way of accurate history taking with reference to tuberculosis, we have reason to consider this a high percentage and a convincing argument in favor of the teaching that manifest pulmonary tuberculosis in the adult is usually dependent upon childhood infection, and that activity is produced by unfavorable influences, economic, moral or physical, rather than by any recent contact with the disease.

The conclusions drawn from this clinical study coincide with those suggested by Baldwin and Gardner[5] after an interesting experimental study with reference to reinfection in tuberculosis.

SUMMARY

(1) Childhood infection is almost universal.

(2) Heavy and moderate infections, especially in the first four or five years of life, depend upon the history of direct contact.

(3) After five years of age many cases show heavy or moderate infection without a history of direct contact.

(4) This increase in the number of cases showing heavy and moderate infection after five years of age without a history of contact, would suggest that massive or gross infection is not due to a single large dose of tubercle bacilli, but rather to the cumulative effect of repeated small doses.

(5) The x-ray is perhaps the most valuable method of determining the degree or extent of infection, but should be employed in the diagnosis of clinical tuberculosis only in connection with a thorough study of the history and a complete physical examination.

(6) There seems to be a definite relation between childhood exposure and manifest pulmonary tuberculosis in the adult as shown by the fact that routine history taking showed childhood exposure in 62 per cent of our 200 adult cases.

(7) This preponderance of childhood exposure in connection with adult cases together with Bushnell's[6] teaching that exogenous reinfection in the adult can take place only in the presence of such a large infecting dose as to make it rarely if ever possible and that "the curve of tuberculosis morbidity rises with the increase of want and hardships, and falls with economic, physical and moral betterment,"[7] strongly suggests reinfection from within rather than from without.

(8) We believe there must be many periods of mild tubercle toxemia between the date of infection and the discovery of clinical disease, and that many cases of so-called malnutrition, nervous instability, malaria, anemia, undetermined fever, etc., may be the result of such toxemia.

(9) Finally, since there seems to be a definite relation between childhood exposure and adult tuberculosis (and there are in all probability many vague symptoms in childhood which arise from tubercle toxemia) after having done what we can to prevent early contact with open cases, we should employ every possible means to determine the degree of infection, especially in contact cases in order that those showing heavy or even moderate infection may have special observation and supervision with the purpose of safeguarding the child by improving the environment and by the early recognition of symptoms and signs, should they develop.

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DISCUSSION

Dr. Thompson Frazer, Asheville, N. C.—During the last twenty or twenty-five years we have changed our opinion somewhat about the genesis of tuberculosis. Most of us now accept the idea that tuberculosis in the adult is commonly the result of infection during the earlier years of life. The points to be considered are: is this the only time that infection takes place? Is it possible for the adult to become infected in adult life? If we accept childhood as the time of infection of tuberculosis, what is to be our attitude toward this fact?

The earlier figures are somewhat misleading. Tests made several years ago on children in the

larger European cities showed that 90 per cent reacted to tuberculin at the age of 15. These findings have not been substantiated by later studies. Perhaps one factor is that these studies were made chiefly on children living in poor hygienic surroundings. It is generally accepted that infection increases up to the age of fifteen, at which time we have about 75 per cent infected. Does this represent the infection of the whole population or only that class upon whom the tests were tried? Dr. Harman said the other night that only 75 per cent of adults responded to the test, so I think we cannot say that everybody is infected in childhood. Most individuals are infected during childhood and certainly the number increases until adult life is reached.

What is going to be our attitude toward these early infections? We know that most individuals infected with tuberculosis do not break down. It has been suggested that these minimal infections confer a certain resistance to the ravages of the disease, and that, if small enough and not too often repeated really protect us against the more severe forms of the disease. We know it is a serious thing for an infant or young child to become infected. We must protect young children and infants from infection, especially because we know they are prone to run to the acute types.

It is sometimes very difficult to get a definite history of exposure to infection, because, as we know, it is not always a member of the family who is the source of infection. Dr. Hess cites the case of a tuberculous nurse who came to a children's hospital. These children had been given the von Pirquet test with negative results. In a very short time a number of the children had become infected.

In the meantime if we treat every child as a possible case of tuberculosis, in other words if we bring up the child in a hygienic manner, there will be less danger of developing tuberculosis, for after all the tubercle bacillus is only one cause. It is a necessary cause but it is only one cause; for we have to have a lack of resistance on the other hand, before infection develops into disease.

Dr. J. J. Singer, St. Louis, Mo.—My work is almost wholly confined to tuberculosis of adults. In my clinical work I am connected with the Pediatric Clinic at Washington University, St. Louis. The individuals who are diagnosed tuberculous in the Pediatric Clinic, as they approach the age of 13 or 14 are ultimately transferred to the adult division. It has been a great surprise to me to see the cases coming to our clinic diagnosed as tuberculous, which when examined according to our adult methods show no evidence of tuberculosis.

It brings up the question of the diagnosis of tuberculosis. What is that condition that we label tuberculosis? Is it, as in the adult, a history of loss of weight, fatigue, hemorrhage, a little cough, night sweats, x-ray densities that do not belong there, and positive tuberculin reactions? In children as we see it you have not that clinical entity that the diagnosis is manifested by in adult tuberculosis. We all make the diagnosis on the history as outlined and find almost without exception some density in the lung, usually in the apex. Your Vice-Chairman and I had a case at the Barnes Hospital, a boy of 12, who gave every evidence of having tuberculosis. He had fever, sweats, and a shadow in the lung in the apex. There were no bacilli in the sputum. From the standpoint of physical diagnosis, x-ray diagnosis and the history the boy undoubtedly had tuberculosis. Within three weeks that entire shadow disappeared, the rales disappeared and within a year there was absolutely no evidence of anything in the boy's lungs. I am sure that this case on its merits would warrant a diagnosis of tuberculosis and I am sure that all of us would have made that diagnosis. We have seen so many times the disappearance of this very diagnostic point that we should be careful in our examination and moderately sure that we have all the evidence that goes to make the diagnosis.

Perhaps the conditions that we frequently diagnose as tuberculosis are really not tuberculosis. It has been proved only on the postmortem findings that certain cases were tuberculosis, and when we realize that practically every one in the cities shows some evidence of tuberculosis, we must hesitate in saying definitely that we have so many patients with and so many without it.

Dr. Philip F. Barbour, Louisville, Ky.—There are two points I would like information upon: first, the frequency of house infection. I heard Hamburger in Vienna tell of the number of children to whom he gave the von Pirquet test. My recollection is that 75 or 80 per cent reacted to the test. In Vienna the houses are very dirty and poorly ventilated. It would seem to me that these houses become infected and from the little fresh air that gets into the rooms they are never disinfected. I have been trying to have our Tuberculosis Association in Louisville keep a register of the houses where there has been tuberculosis. I do not know whether house infection ever produces tuberculosis. Some of the cases seem to point to that as being the only way in which the child could have gotten the infection.

When a mother has had tuberculosis and apparently recovers from it, then gives birth to a baby, what precaution should be taken in the life of that child? I have one mother, the wife of a doctor, who was treated at Saranac and so far as the clinical symptoms are concerned was entirely relieved. She has two children and passed through her pregnancies and labors very nicely. The children were very strong and they remained strong for many years. The oldest child is seven or eight years. The mother's tuberculosis is lighting up again. These two boys have been pretty healthy. Are these children more immune having been born at a time when the mother was healed of tuberculosis, or should we take special care of them and consider them as potentially tuberculosis patients?

Dr. L. B. McBrayer, Sanatorium, N. C.—We have done some studies on general infection in different communities. We made a careful study in one community where there were sixteen times

more deaths in the last twenty years than the average death rate in the United States. We made a tuberculin test on half of the people and a physical examination in all cases where the test was positive. Notwithstanding the amount of exposure, because these people went to the same school and to the same church, visited back and forth, and worked together, there were only 50 per cent positive reactions to the von Pirquet test; and less than one-fourth of those showed physical findings. There were a hundred families in this community which had been living there for the past twenty years. Of those we could trace only twenty-five who had had cases of tuberculosis. I remember very distinctly that all the cases were confined to sixteen families. That substantiates the statement of exposure.

There was one family consisting of a mother and two boys. The mother lived on the farm with one boy until he became so feeble that he could not work. This son took his two boys and moved to the town where the study was made. This mother and grandmother had tuberculosis in the advanced stage and we believe she infected this son and the two grandsons. The father went into the village where he and his two boys could work in the silk mill, and all of them died of tuberculosis. Then the mother went across the country and lived with another son, B. She lived there only three months when B. died of dysentery. B. had three children and so far as we could learn they were never before exposed to massive doses of the tubercle bacillus. There was a girl nine months old, a girl two years old and a boy of twelve. The grandmother died soon after her son B. B.'s wife and three children moved into the silk mill town so the boy could help support the family. At the time of this survey the two girls were dead of tuberculosis; the boy had clinical tuberculosis; and the mother had clinical tuberculosis. The boy has since died and the mother is confined in the alms house for want of a better place to go. That coincides with these records everywhere and as we continue to mass these records and studies, we shall probably prove, as we have proved many things from clinical research, the time of infection and other things that we are extemely anxious to know about tuberculosis.

There is one thing I would like to ask the authors of the paper: that is, if they consider in the x-ray plates all the densities they have found in the bronchial glands and other places as x-ray findings. We all know that bronchial glands showing densities are caused in childhood by an enormous number of things other than tuberculosis. I should like to ask Dr. Moorman in closing to tell us if account was taken of these things.

Dr. I. S. Kahn, San Antonio, Texas.—I feel confident that where the family history in these cases is negative for tuberculosis, in certain instances the infection is due either to non-recognized familial tuberculosis or to prolonged contact in childhood with some tuberculous individual in the same house.

Dr. McBrayer has brought up the point that shadows shown by the x-ray are caused by other things than tuberculosis. The size of the hilum shadows also varies normally with different ages. The notation of areas of calcification made by the authors makes their findings more definitely suggestive of tuberculosis. What would have rendered their findings of still more scientific value would be a record of the tuberculin reactions in their various hilum enlargements, as positive von Pirquet tests in these cases of enlarged hilum shadows and similar negative tests in the non-enlarged hilum would add considerable proof to their tuberculous diagnostic conception of such enlargements, and give us a rational basis to account for the high percentage of such positive tuberculin findings in adult life where there are no indications of clinical tuberculous disease.

Dr. J. W. Laws, El Paso, Tex.—One of the most difficult things that I have to contend with as refers to children is in making a diagnosis in a child who presumably is not in a true tuberculous state. I now have a child of twelve who runs a temperature, is highly nervous, has certain suggestive symptoms that point to tuberculosis, but in whom the clinical findings outside of and excluding other things do not offer very positive evidence that the child has tuberculosis. In treating such a child we feel that it is necessary to look after the hygienic conditions until she has passed into adult life and beyond the stage of becoming an actively open case.

In adult tuberculosis the patients we see are usually those who are crowded through school as children and were overworked. I feel that not enough attention has been called to the most important cause of the development of tuberculosis: that is the lowering of the vitality of the patient which causes the development of some point of infection that has been there at some time unknown to us. If the parents, when they place their children in school, would not forget that it is not a question of that child's taking so many grades in school and graduating at a certain time; if they would remember that the one important thing so far as the future goes is that the child should not lower its vitality, the frequency of tuberculosis in childhood and in young adults would be much reduced. The public should know that from childhood to adolescence and from adult life on to past forty or fifty we must not at any time lower the vitality too greatly or tuberculosis may develop.

Dr. L. B. McBrayer, Sanatorium, N. C.—In the studies I referred to I thought you would probably be interested to know what was found in the survey of the houses, one in which there had been two deaths from tuberculosis and the other three. The first house, after being vacated by the party in whose family the deaths occurred, stood empty a year. That must be taken into consideration. After that time a negro family moved in and lived there sixteen years, raising a family of eight children. There was no illness during the raising of those children nor any apparent infection of tuberculosis, though we did not get a von Pirquet test. The family living in the second house had very much the same history, moving in after the tuberculous family had moved out. I doubt very seriously that a house that

has plenty of sunlight will harbor tuberculosis bacilli. Certainly it will not if the patient who lived there was at all careful with the sputum.

Dr. W. McKim Marriott, St. Louis, Mo.—I would like to say a word of warning about two methods of diagnosis in tuberculosis. The first is the x-ray. One is not justified in making a diagnosis of tuberculosis in children on the basis of an x-ray examination alone (miliary tuberculosis excepted). I have come to that conclusion since the influenza epidemic more than ever before. We do not make a diagnosis of tuberculosis on x-ray plates even if we do see what appear to be calcifications. The last time I saw that error made was when a very well-known x-ray man said he would base his reputation upon a certain plate's being indicative of tuberculosis. Two days later we saw the post-mortem and there was no tuberculosis.

The other method is the von Pirquet test. Once in a while we get samples of tuberculin that do not react. No von Pirquet test should be considered negative unless the tuberculin has been tried on a known case of tuberculosis and reacted positive. No reaction should be considered negative until we have done an intradermal with as much as one-tenth of a milligram of tuberculin. Many children will react with that when they will not according to the von Pirquet technic.

Dr. W. W. Harper, Selma, Ala.—I should like Dr. Marriott to tell us the diagnosis in the case he mentioned.

Dr. Marriott.—The diagnosis was bronchopneumonia.

Dr. Moorman (closing).—I desire to confirm what Dr. Frazer says about discrepancies in the symptoms with reference to tuberculosis in children. I, like Dr. Frazer, was surprised to hear Dr. Hamman state that only 75 per cent of adults react to tuberculin and I was equally surprised to hear him speak of the positive diagnostic value of the negative test without reference to the fact, just mentioned by Dr. Marriott, that the tuberculin might not be potent. There are also many cases in which the test may be negative on account of intercurrent diseases (measles, etc.), miliary tuberculosis or tuberculous meningitis.

The percentage of children infected cannot, of course, be definitely determined. When we realize that a tubercle bacillus may rest in a lymph node for months without giving rise to a single symptom, and without producing sufficient cellular changes to be recognized microscopically, its presence being determined only by animal inoculation, we must admit that it is difficult to prove the presence of these infections.

Dr. Singer referred to the appearance of densities and Dr. Marriott also referred to the question of x-ray diagnosis. Our x-ray plates are read particularly with reference to the shadows which we take to represent caseation or calcification and those shadows do not disappear in a few weeks or a few months. We have kept fully in mind the other shadows which arise through acute inflammatory conditions. With reference to measles, whooping cough and other diseases that give rise to glandular enlargements, especially enlargements of the tracheobronchial glands, the shadows are not like those found in caseation or calcification. In a study of 450 children under fifteen years of age, in the Oklahoma City Tuberculosis Dispensary, we found that 70 per cent gave a history of whooping cough, 79 per cent of measles, and 25 per cent of pneumonia; and yet in these cases we found the D'Espine sign present in only about 25 per cent. It is our experience that these acute infections do not give rise to any marked changes in the tracheobronchial glands. We think the enlargement is not great and that it soon subsides. We have proven the significance of the densities referred to above by post-mortem x-rays, before and after dissection, by inspection and palpation and later by laboratory examination.

House infection has been a stumbling block in the study of tuberculosis. There is undoubtedly such a thing as house infection, but perhaps too much importance has been attached to it. No doubt the most important feature of the so-called house infection in our cities is environment. If a house is poorly ventilated and dark, the environment tends to develop tuberculosis whether the infection arises within that house or within the neighbor's house. The people who must live in such houses are also poorly nourished, so I think environment is perhaps the greatest factor in the so-called house infection, though some of the investigations tend to show the repeated development of tuberculosis in some of the houses in the rural districts.

With reference to the tuberculous mother apparently quiescent or arrested giving birth to a child, a mother having received sanatorium management at Trudeau should be sufficiently educated to give her children the protection which they have a right to demand. She certainly should be on guard for the least indication of activity and her sanatorium training will prompt her to seek the advice of some one competent to make a thorough chest examination and through intelligent action the child may be protected against massive infection.

In 1882, when Koch discovered the tubercle bacillus, the world stood agog, and now that the specific cause had been discovered, many believed that tuberculosis would be wiped from the face of the earth in a few years. A little later when Koch announced tuberculin as a possible cure there seemed to be a new hope for those already suffering from the disease. But we were doomed to disappointment in both instances.

What really happened was this: when von Pirquet conceived the idea of using tuberculin as a diagnostic measure it was found that the infection was almost universal. Despite these illuminating facts we have to admit that there are many places where the light has not penetrated and we are confronted today with the question of resistance and immunity and the chasm which has to be bridged between the point where infection takes place and clinical disease begins. I should like to bring to Southern pediatricians the responsibility of bridging this chasm. We have to reason from effect to

cause rather than from cause to effect. We have demonstrated by the use of tuberculin, postmortem examinations and x-ray studies that infection in children is almost universal.

The process which leads to demonstrable pathology must at some time in its course produce certain symptoms and signs which if recognized and properly understood would enable us to diagnose tuberculosis where it would otherwise be overlooked or wrongly diagnosed.

This responsibility belongs particularly to pediatricians because they have charge of children at that period when they are most susceptible to infection and when they are most likely to have symptoms of toxemia arising from such an infection. Pediatricians should be peculiarly equipped for this task because their diagnostic skill is augmented by the fact that in the young child they cannot depend upon history except as it is obtained from the mother or nurse. If the chasm is ever spanned it must be through the discovery of slight symptoms, and their proper correlation in case after case, with observation extending over a long period of time.

REPORT OF A CASE OF HYPERTROPHIC PYLORIC STENOSIS, COMPLICATED WITH MARKED PYLOROSPASM*

By H. Leslie Moore, A.B., M.D.,
Dallas, Tex.

A male child, 18 days old, came under my care with the following history: it was the first child of healthy parents and weighed eight pounds at birth. It began vomiting the first day, and the vomiting increased in frequency each succeeding day. An unusually large amount of mucus was vomited each time.

The obstetrician at first paid no attention to it, but later, the attacks coming so often and the mucus in such large quantities, he concluded that it was a cold and began giving frequent doses of castor oil. All symptoms were aggravated and at the end of the first week the patient had lost a pound in weight.

On the first examination I found moderate emaciation, explosive vomiting after most nursings, no visible peristaltic wave and a well digested, constipated stool. The patient weighed 6 pounds 12 ounces.

He was put on 1-1000 gr. of atropin every 3 hours before each nursing, and later on 1-500 gr. He was given two stomach washings daily. The mucus was very thick and tenacious, frequently completely stopping a No. 16 catheter, and there was an unusually large quantity.

Under this treatment the vomiting became less frequent but no less forceful, and the patient slowly gained in weight, showing an increase of 8 ounces in fourteen days. Up to this time no peristaltic wave had appeared and no tumor could be palpated. The weight remained stationary for several days, the vomiting increasing, and in three days the patient had lost all that was gained in two weeks. At this time a tumor could be palpated over the pyloric region and a peristaltic wave was noted.

Immediate surgical interference was decided upon and the Rammstedt operation was done by an experienced surgeon and a full size tumor found. The patient was now six weeks old and weighed 6 pounds 12¾ ounces. I was entirely satisfied with the thoroughness of the operation and expected immediate relief of all symptoms, such as I had gotten following operations in all other cases. Such, however, was not the case.

The vomiting continued almost as severely and the peristaltic wave was just as great. One week after the operation the weight was 6 pounds 9½ ounces, a loss of 3 ounces. At this time atropin 1-1000 gr. was again started and the next day increased to 1-500 gr. before each nursing, and on the third day the dose was increased to 1-330 gr. At this time the weight had fallen to 5 pounds and 15 ounces. On this dosage there was an improvement as regards vomiting, and a few days later a further increase was made in the dosage to 1-250 gr. A marked improvement quickly followed and by another week the vomiting had practically ceased. The atropin in reduced doses was given for six weeks following the cessation of vomiting.

One month after the beginning of the atropin treatment a gain of 1 pound and 5½ ounces was noted. During the second month there was a gain of 2 pounds 10 ounces. The third month, there was a gain of 3 pounds 1½ ounces, and during the fourth month, 3 pounds 1½ ounces. Four months after the beginning of the heavy doses of atropin, the weight had increased 11 pounds 1½ ounces.

The baby, beyond a doubt, had also a pylorospasm due to a thickened mucosa and a hypertrophied musculature, causing an obstruction equal to the tumor. The mucus continued in large quantities, but became very thin after the above treatment was instituted. Stomach washings were continued twice daily up to the time the vomiting ceased. Every time the stomach tube was introduced, about 2 ounces of mucus and gastric juice would syphon off.

DISCUSSION

Dr. John Zahorsky, St. Louis, Mo.—We have that clinical condition known as hypertrophic pyloric stenosis and we try to make out that clinical condition called pylorospasm.

We have pyloric stenosis so impressed on our minds that when a baby starts to vomit everything and begins to lose in weight we send him to the operating room. I have done that twice and did not find anything at the operation. We should be very cautious in making this diagnosis in babies who commence to vomit immediately

*Presented in Case Report Session, Section on Pediatrics, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

after birth. We have numerous cases that vomit immediately after birth and we find mucus in the stomach washings. These cases do not belong in this group. There is not much peristalsis in the newly-born babies. That seems to be a habit that the stomach gets into after working two or three weeks. We do get in this group of cases a peculiar contraction of the stomach. We watch the stomach and suddenly in its region a marked contraction is seen. Whether it is an infection gastritis in some of these cases I do not know, but they really deserve most careful study. I think it was Still who tried to make out a mucous gastritis very much like our mucous colitis. Probably there is something in it. At any rate, we have in newly-born infants inflammation or irritation or irregular contractions of the stomach which are very frequently mistaken for hypertrophic pyloric stenosis. A patient may be sent to the operating room who does not belong there. It is to this particular group that I desire to call attention.

Dr. W. W. Harper, Selma, Ala.—I hope that Dr. Moore in closing will state whether he found any tumor.

I should like to report a case that we thought was pyloric stenosis, which we operated upon and found to be a constriction of the duodenum due to a congenital band. I have seen several cases of hypertrophic stenosis and I find that most of them do not start vomiting until about ten or twelve days after birth. The child above referred to began vomiting soon after birth—I think the first day in the afternoon. It was given castor oil, enemas and castor oil again without result. They were never able to get a bowel movement. It was probably nursed two or three times and then there was a discharge of milk and stomach contents. Two interesting things in this case were: first, that vomiting began the first day of birth; and second, that the whole stomach contents were stained with bile, something I had not seen before. The stomach contents were green.

I thought it was a case of hypertrophic stenosis. We took an x-ray picture and not a particle of anything passed through the duodenum.

Under local anesthesia we operated, expecting to do a Rammstedt operation. There was nothing wrong with the pylorus, but at the distal end of the duodenum there was a band which encircled and contracted the duodenum. The appendix and cecum were "gathered" at the duodenum. We cut the band and the child was relieved of its nausea and vomiting and appeared to be fairly well. A few hours later it died without warning. We did a post-mortem and found the small intestines filled with glucose solution given by mouth after the operation. At the time of the operation they were empty.

Dr. C. E. Boynton, Atlanta, Ga.—In the last few years I have come to the conclusion that true hypertrophic stenosis, meaning by that a true tumor of the pylorus, is much more rare than we formerly thought. The vast majority in my experience respond to the atropin treatment, which makes me believe that the condition is largely spasmodic.

The majority of these cases do not begin to vomit until they are at least two or three years old, and I do not believe that the vomiting would have been delayed so long if the condition had been a true stenosis. I make a solution which contains 1-5000 of a grain of atropin to each drop, and begin with four or five drops twenty minutes before each nursing and increase one drop at each nursing, provided vomiting has occurred since the last dose. If flushing or dilation of the pupils occurs, I increase the dose less rapidly. So far, all cases have responded to this treatment.

Dr. A. G. Jacobs, Memphis, Tenn.—There are different conclusions which may arise in connection with the symptomatology. I have in mind two cases that I have seen in my practice. They were of a peculiar type and the description of one will tally very much with that of the other. I was called in consultation to see a baby 10 days old and found a history of constant regurgitation of food immediately after nursing. It seems that the mother had good milk; the baby was hungry and shortly after nursing all the milk taken was regurgitated. They changed the breast milk to condensed milk and then to malted milk, but no matter what food the child would take it was regurgitated. Though the child was ten days old the stools consisted entirely of meconium. I started to pass a stomach tube with the idea of getting some of the gastric contents for examination. We introduced the tube a few inches when it doubled on itself and came back. I made repeated attempts and could not understand why I could not pass the tube. I asked the other physician to try and he had the same experience. The tube would go a little way and then come back. I came to the conclusion that there must be an obstruction in the esophagus. We sent for a nose and throat man. He introduced an instrument with light attachment a little way and told me that there was a *cul de sac* a short distance down and no esophagus. The child, of course, starved to death, and the autopsy showed a congenital lack of the esophagus.

There was nothing but a ligament that replaced the esophagus. I had the fortune or misfortune to meet with another case like that in six months. I have not seen one since.

Dr. Eugene Rosamond, Memphis, Tenn.—About two years ago I saw a 3-months-old baby who was in a rather severe physical condition. The child was operated upon and the Rammstedt operation done. The operation was very thorough; in fact, I thought the surgeon was going to open the tumor half way up the stomach, and there was a point down on the duodenum that he did cut through. He made a purse-string suture and closed that up. The tumor was thoroughly opened and the mucous membrane ballooned up into the incision as it should do. The operation had been thoroughly done and should have been successful. It was not. The baby vomited after getting off the table just as before. We repeatedly gave him 3 minims of

1-1000 atropin solution. It made him turn red, but failed to relieve the vomiting. The child was in a desperate state, but we reopened the abdomen and did a posterior gastroenterostomy. I do not see how the weak, exhausted infant stood both operations, but it did. He was fed one and one-half hours after he came off the table with the gastroenterostomy and made an uneventful recovery.

We attributed failure of the first operation to edema. There was no leakage, the purse-string suture was all right, and the operation looked as though it should be all right. There was some edema. I believe that massive doses of atropin might have helped him. He probably had a pylorospasm.

Dr. W. McKim Marriott, St. Louis, Mo.—Dr. Moore's paper and the discussion bring out one very important point, that is, that too many of these cases of pyloric stenosis are operated upon. The diagnosis is sometimes made recklessly. Though pylorospasm is present it is not always an indication for operation. I saw one case in which for months there were waves of peristalsis and symptoms of a palpable tumor, but the child did not vomit. Waves of peristalsis occur from other things. The natural history of this disease as shown by autopsy and x-ray findings in patients who have had pyloric stenosis shows that when the infant grows older, although the tumor of the pylorus may become larger, the pyloric opening also becomes larger, and the child may recover spontaneously. If a child reaches the age of four months and maintains fair nutrition, then the pyloric stenosis usually amounts to little. I have seen x-ray plates taken recently of cases upon whom several years ago posterior jejunostomies were performed for pyloric stenosis. The x-ray showed that the bismuth meal passed through the pylorus and did not go down to the jejunum.

I do not believe you can make a differential diagnosis between pylorospasm and hypertrophy by the duodenal tube. I recall one case in which it was decided to operate. The surgeon opened the abdomen and said there was nothing there. He picked up the pylorus and as he held it in his hand the pyloric tumor enlarged until it was a typical hypertrophied pylorus. A Rammstedt operation was done and the child stopped vomiting.

One method of treatment that has not been dwelt upon is thick cereal feeding. This, in my experience, has been more valuable than atropin and is a method which we have used on practically all cases. During the past year we have had fifteen cases of pyloric stenosis. Of these, six only were operated upon. In the case of breast-fed infants vomiting a large portion of the milk, we have always advised early operation. In infants who have already been weaned, it is usually advisable to attempt treatment with atropin, thick cereal, gastric gavage and refeeding. The remaining nine of last year's cases were treated in that way. There was no mortality in either the operated or the unoperated cases.

Dr. L. R. DeBuys, New Orleans, La.—I reported a case of pylorospasm many years ago before the American Medical Association. Some of you probably remember the motion pictures of the peristaltic waves. That case was never operated upon. Today she is a big, beautiful girl. An interesting incident about that case and another case that has never shown any symptoms of pyloric obstruction is that both these children had swallowed coins at about the same time, which brings up a point about the opening of the pylorus as the age of the infant advances. The child who had the pylorospasm and had never been operated upon passed her coin in forty-eight hours. The other child, who had never shown any symptoms referable to the pylorus, retained the coin for twenty-eight days. This shows how patulous the pylorus does become in these cases of pylorospasm if we are a little patient and allow the pylorus to open. If we can get a sufficient amount of food into these babies to keep them going sufficiently, or even prevent loss of weight, we can procrastinate and frequently avoid operation.

Dr. Philip F. Barbour, Louisville, Ky.—I held an autopsy once upon a negro girl, 15 years of age, who had been vomiting all her life and was greatly emaciated. I found a hard mass at the pylorus larger than my thumb and also as dense. I could not introduce a knitting needle through the opening. She had lived all these years, I do not know how, but she had found that the only food that she could take without vomiting was raw eggs. I have often thought they might be used in these cases. She would take milk and vomit it immediately.

I had a case of suspected pyloric stenosis during the war, the child of an officer. The child had been x-rayed repeatedly and had forty or fifty plates taken in the course of an hour. The x-ray man pointed out this: that in the half-minute from one plate to the next there seemed to be almost a complete transposition of the stomach from one side to the other. He said: "You have a spasm here which travels over the stomach from one side to the other." We put the child on very large doses of atropin and a skimmed milk diet and it became entirely well.

Sometimes we rely too much upon the x-ray in making our diagnosis. It has proved disappointing in many cases. The doctor who first examined this patient said it was a case of pylorospasm and she would have to be operated upon. There was absolutely nothing found the matter with the pylorus. I believe the administration of atropin does good in many of these cases and it certainly ought to be pushed until we can be sure it is giving us the results that we want, or fails to give relief.

Dr. L. B. Clarke, Atlanta, Ga.—Indiscriminate operating upon these babies is wrong.

I appreciated Dr. Zahorsky's statement regarding the vomiting that occurs in the new-born baby for several days, which is too often diagnosed as pylorospasm or what not, when in all probability it is due to some other cause. I do not wish to repeat what has been said by the previous gentlemen. No case of mine has been operated upon for five or six years. Three years ago I ran five cases at the same time and they all recovered under medical treatment. After

the atropin treatment came in I found it the very best measure that could be applied, no matter how long it had been running. The best food that I ever found when mother's milk was not present was skimmed peptonized milk.

There was some talk this morning regarding the infectious nature of certain diseases which heretofore were supposed to be non-infectious. I wonder if any one of you has ever encountered more than one case of pylorospasm in one family. The finest child I have had in my work was a boy who, for about nine months, suffered with pylorospasm. Three years later a girl came to that family and she had exactly the same condition. Both were treated medically, washing the stomach when necessary and with other medicaments. They were put upon skimmed peptonized milk. The mother made the diagnosis herself on the second child after the long period with the first child. The second became as fine a specimen later as the first.

Dr. Ralph C. Spence, Dallas, Tex.—This seems to be a discussion on pyloric stenosis rather than on Dr. Moore's paper, "Pyloric Stenosis Complicated with Marked Pylorospasm." Since this is the case, it might be well to report some statistics. We studied 163 cases of pyloric stenosis, all of which were operated upon by Dr. Downs or by Dr. Matthews in the Babies' Hospital, New York City, and in their study we tried to work out the factors which control the prognosis. The total mortality for these 163 cases was approximately 18 per cent, or 23 cases. We found on studying these cases that the mortality of the cases that came to operation four weeks or more after the onset of the initial symptoms was three times as great as that in the cases which came to operation under four weeks. A great many of those cases were treated by atropin. We also found that of those cases which had lost more than 25 per cent of their best weight before coming to operation the mortality rate was four times as great as for those cases which had lost less than 25 per cent of this weight. Of those cases which were absent breast fed, and in which the doctor had not taken them off breast milk before coming to operation, the mortality was three times less than for those cases in which the child had been taken off breast milk and given other types of food. Out of the whole series there was only one fatal case which was breast fed up to the time of operation, which had vomited less than four weeks, and which had lost less than 25 per cent of its best weight at the time of operation. That case bled to death. On further investigation we obtained a history of bleeding in the family. From this study it was concluded that the best thing to do for these cases is to make an early and correct diagnosis and then operate immediately.

Dr. Moore (closing).—I should like to ask Dr. Spence if he knows what size doses of atropin were given. The purpose of my paper was to bring out the atropin treatment and to emphasize the fact that you can have both conditions at the same time. Do not stop at small doses, but work up gradually until you get results. If the child is losing too much weight, then operate. I make a differential diagnosis in every case on atropin if I get the case early. In the past three and one-half years I have had 17 cases operated upon. Sixteen showed full size tumors. One case had convulsions and we had not time to work the case out. We operated and found no tumor; it was a pylorospasm. The child recovered due to the atropin and not to the operation, but died six months later during a convulsion supposedly due to malaria. The other sixteen showed full size tumors. I did not try out the atropin treatment on every one of the sixteen. If you have plenty of time and your child is not losing too much weight, you should try the atropin in order to eliminate a probably pylorospasm. These cases of pylorospasm are probably the easiest in which to make a diagnosis. They quickly improve. If they do not, it is nearly always a stenosis. When we operate we find the trouble to be an hypertrophic pyloric stenosis.

Until recently I would never go beyond 1-500 of a grain of atropin in a child three weeks old. But now I increase the dose up to 1-150 of a grain every 3 hours if necessary. You have to do it slowly. You drop back if you get a reaction and then come up again. I have never had to go above 1-250 of a grain. If the child is losing weight fast, I stop medicinal treatment and operate.

There has been some question about the time for operation. I have seen two cases of vomiting from birth where the child vomited everything that was taken. One child was operated upon the fourth day. A Rammstedt operation was done and a pyloric tumor found. The child went on to complete recovery. My own case was six days old and it vomited from the time of birth. The child was losing fast because nothing was retained. A Rammstedt operation was done with complete relief. These babies were failing fast and it would have been fatal to postpone operation. Both cases were hypertrophic pyloric stenosis.

There was a full-size tumor in every case that I reported with one exception. In every case I supervised the operation. These seventeen operations were done by eleven different surgeons with two fatalities. I stayed with each one to see that it was done right. The most difficult thing is to keep the surgeon from cutting down on the mucosa with the blade of the knife. It is difficult to get them to use the handle. Most of the deaths are due to making pin-point punctures through the mucosa. If this is done, in a few days the baby dies of peritonitis.

The most important thing about the operation of pyloric stenosis is the after-treatment. It is more important than the operation. The operation can be half done and if the after-treatment is good it will save a majority of the cases. A few days ago a surgeon operated upon a case and found a full-size tumor. A Rammstedt operation was done, but vomiting continued. I did not see the operation, as it was not my case. Two days later the doctor met me in the hospital and asked me to see the case. On examination I found that the abdominal binder was too tight. I loosened it and the vomiting immediately ceased.

EIGHT CASES OF JAUNDICE*

By J. Ross Snyder, M.D.,
Birmingham, Ala.

Five cases of jaundice were seen by the writer in the month of September, and three cases in the month of October of this year (1921). Seven were seen in private practice and one at the University Free Dispensary. In no case was there a history of any other member in the household's having a recent illness. In none was there a history of alcoholism or of tuberculosis in the family. The mother of one case had had two attacks of acute rheumatic fever. In none of the cases was a Wassermann done, but syphilis is believed to have been satisfactorily excluded in all histories.

All of the cases were boys. The youngest was four years old and the oldest, ten. Seven were white boys. The eighth was a mulatto. Seven lived in Birmingham and drank from the same water supply. One lived in Bessemer, twelve miles from Birmingham. The closest distance between any two cases was eight city blocks. No two were supplied with milk by the same dairyman. Five had hypertrophied tonsils. All had good teeth except one. One had had his adenoids and tonsils removed four years previously. One had had his adenoids and tonsils removed one month previously. Four of the cases had recently recovered from impetigo contagiosa. Except for impetigo no illness of any nature had been suffered by any of the cases for at least a year prior to the attack of jaundice.

One case had been treated when an infant by the essayist for a severe attack of intestinal toxemia due to contaminated milk. Except for chronic constipation, two attacks of tonsillitis and a recent attack of impetigo, he had remained well until the jaundice attack. The mulatto had been treated by the essayist three years before for pellagra. At the time of his jaundice attack there was no remaining evidence of pellagra.

The oldest boy in this series of cases had had an eventful career. He had malaria when eighteen months old. No plasmodium was found in his blood during his recent illness. In the fall of 1914, he had lobar pneumonia. In the winter of 1915, he and his mother and another child in the family had lobar pneumonia. In the fall of 1918, two other children and the mother and the grandmother along with him, had influenza. The boy had broncho-pneumonia as a complication. In the fall of 1915, this boy was treated by the essayist during an attack of jaundice with symptoms much more pronounced than during his second attack. Of all eight boys, this lad is apparently the most robust. He is over weight (85 pounds); his tonsils and adenoids have been removed; his teeth are in perfect condition; he has not had impetigo; and his diet has been carefully supervised. However, his family, consisting of mother, father, four children and grandmother, belong distinctively to the lymphatic group. All the children have had repeated attacks of tonsillitis. All have had repeated attacks of otitis media. One child, the only girl, had had pyelitis. Several of the children and the mother have had pneumonia and the mother has an enlarged thyroid.

The blood was examined in three of the eight cases. In one the hemoglobin was 45 (Tallquist); in another, 60 (Tallquist); and 50 in the other. The white blood count in one was 5600; 10,800 in one; and 8500 in the other. Plasmodium was found in no case. The stools of these three cases were examined microscopically. Ova were found in none. Three of eight cases were on a well regulated and well balanced diet. The other five were eating sweets in unwholesome amounts and were drinking little milk. The weights of three of the cases were taken. All of the cases were apparently above the average in weight except one. Symptoms and treatment were similar in all cases and, therefore, a detailed report of only one will be given.

J. H. S., a white boy, four years old, was an only child. Except for mild attack of whooping cough two years previously, he had never been sick. Mother and father were well and had been so for the previous five years. Four weeks

*Read in Section on Pediatrics, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

previous to examination, the patient began to complain of soreness and pain in his abdomen. Following that, the patient vomited several times a day for two or three days. There had been no vomiting for two weeks prior to first seeing him, but he still complained of stomach ache. If there was any fever the parents and family physician did not discover it. The appetite had been poor for at least three weeks.

Jaundice of the skin and conjunctiva had become gradually more marked. His skin itched. He was drowsy. His stools were chalky. The tonsils were very much enlarged. The heart was normal in outline, but a soft blowing murmur was heard at the base. The pulse rate was slow, 70. The temperature by mouth was 97 degrees F. The tongue was coated, but moist. The teeth were in good condition. The lungs were negative. The liver was not palpable, but there was some tenderness over the gall-bladder. There was no muscular rigidity. The spleen was not palpable. No masses were felt in the abdomen. The prepuce was elongated and adherent. Old impetigo scars appeared on the legs.

The urine was a deep amber color. Specific gravity, 1022; reaction, acid; negative for albumin and sugar tests; uric acid and calcium oxylate crystals abundant; deep bile ring with Smith's test; and a few pus cells.

This case was first seen on September 21, 1921. The tonsils were at once treated with nitrate of silver solution 10 per cent. He was put to bed and mustard paste was applied to the liver region. Water was forced up to one quart per day. A heaping tablespoonful of effervescing sodium phosphate was prescribed every three hours while awake. His diet was limited to broth, stewed fruits, boiled vegetables, gelatin, toast and corn bread.

When seen again Sept. 28, the jaundice was fading and the appetite was good. He was bright and cheerful and wanted to play. No tenderness was present over the gall-bladder. The urine was light amber and showed only faint bile rings; the stools were soft and black, but no diarrhea existed. The hemoglobin was 60. White blood count was 8400.

It is not claimed that the line of treatment followed in these cases had much, if any, influence upon the course of the disease. The cases are reported with the hope that interest in such cases will be stimulated and that this will lead to some definite understanding of their true nature.

DISCUSSION

Dr. John Zahorsky, St. Louis, Mo.—So-called epidemic jaundice is a subject I have been extremely interested in for a number of years. About ten years ago we had an epidemic in St. Louis. It occurred in the fall, and by the way, these epidemics of jaundice nearly always occur in the fall. I had twenty-one cases at that time. Almost every September and October we have these cases in St. Louis. This fall I saw ten cases. What causes this seasonal epidemic we do not know. The patients always get well, so we have no post-mortems. We should like to know the cause. I think studies from the different parts of the country bringing in their etiologic factors would be of extreme value. It has been suggested in St. Louis that this infection must be carried through some of the fall fruits, such as apples. Whether there is a germ in some of the fruits which first attacks the duodenum, where our primary focus of infection is, is a question. I am glad that this subject is being studied in other parts of the country.

Dr. W. W. Harper, Selma, Ala.—I should like to report an epidemic of this disease that occurred in a small country village, as given to me by a doctor friend of mine. It was an epidemic that broke out in the neighborhood of a school and happened last spring. The child would contract the disease at school, go home with elevation of temperature and all evidences of jaundice; and in a short time the other members of the family would come down with it. This shows that it must be infectious.

Dr. Robert A. Strong, Pass Christian, Miss.—I do not think that there is any doubt about these epidemic cases being due to infections, the source of which is of common origin. We very frequently see cases that are sporadic. It is just this type of case which Dr. Snyder has also mentioned that I want to speak of. The story is usually that a very large amount of sugar has been ingested. The motility of the stomach and the operation of its valves are extraordinary mechanisms, the elucidation of which we owe largely to Cannon's classical observations on cats. The reflexes which control the opening and closing of the pyloric valve depend to a large extent upon the reaction of the stomach and duodenal contents. As soon as the stomach contents become acid the cardiac orifice closes and the pyloric valve opens. This permits part of the contents of the stomach to enter the duodenum which becomes acid in reaction for a short while until the bile and other secretions restore its normal alkaline reaction. While the reaction of the duodenum is acid the pyloric valve closes.

Under ordinary cincumstances the play of these reflexes, controlled to a large extent by the reactions of the stomach or duodenum, are nicely adjusted to each other to give each organ its proper share of work and the proper time to perform it, and so the process goes on unimpaired.

The maintenance of the alkalinization of the duodenum depends to a large extent upon the bile and other intestinal secretions. After a prolonged ingestion of excessive amounts of sweets a hyperacidity of the stomach will result. This soon reaches the duodenum, or rather the duodenum cannot maintain its alkalinity on account of the excessive amount of hyperacid partially digested food it receives and an inflammation results. This inflammation soon reaches the orifice of the common bile duct a short distance down and an atresia or stenosis

may result. Thus the bile upon which the duodenum depends for its alkalinity is cut off and a vicious cycle is produced. Infection of the common bile duct is frequently a result of lowered local resistance produced in this way. These sporadic cases of jaundice may be thus explained in part, at least.

Dr. Snyder (*closing*).—After this paper was written I saw one case in a girl. It was the only girl in the series that came under my observation.

THE GASTRO-INTESTINAL EXPRESSIONS OF SYMPATHETICO- AND VAGO-TONIA*

By John B. Fitts, M.D.,
Atlanta, Ga.

Gastro-intestinal pathology generally presents a voluminous train of subjective symptoms and signs which from a clinical standpoint often are difficult of analysis. It is surprising how this obscurity may be cleared when one carries an analysis based upon anatomical relations and physiological function. This principle is particularly applicable to symtoms direct and reflex as found in the gastro-intestinal tract and its adnexa; for here one must determine whether symptoms are of immediate origin or a reflexion from perverted action elsewhere.

The neurologists have recently presented many interesting facts about the two functional nervous disturbances, sympathetico-tonia and vagotonia. These two conditions frequently produce a certain syndrome of signs and symptoms in the alimentary tract.

In the opinion of Beverley R. Tucker,

"Vagotonia accounts in part at least for many asthmatic conditions, pseudo-angina, vasomotor gastric acidity and pylorospasm, and has a definite relation to the nausea and vomiting of pregnancy, certain states of diarrhea, especially mucous colitis and spastic constipation."

Permit me to review a few features of the vegetative nervous system with which we are concerned in this paper. The fibers from this system go to the smooth muscle structures of the intestine, blood vessels, gland ducts and skin, and to certain striated muscles such as the heart. The vegetative nervous system may be divided into two divisions: first, the system of fibers arising from the middle and lower part of the thoracic cord and from the upper part of the lumbar, going to make up the sympathetic system; and second, the system of fibers arising from the brain and medulla and in part from the sacrad portion of the spinal cord. In this second division is the vagus, the largest and most important nerve of the viscera, which supplies the heart, bronchi, esophagus, stomach, intestine, liver, gall ducts and pancreas.

The pelvic nerve from the sacral segment supplies the descending colon, sigmoid, anus, bladder and genital apparatus.

It is the proper balance of the two systems, sympathetic and vagus, that preserves normal physiological action. Electrical stimulation shows many physiological antagonisms in the two systems. Pharmacological substances such as adrenalin act entirely upon the sympathetic system. Pilocarpin, physostigmin and muscarin stimulate the vagus. Atropin counteracts the effects of stimulation of the vagus, produced by the above drugs. It is interesting to note that these drugs vary in their stimulation of the various branches of the vagus system, also that vagotrophic and sympatheticotrophic action varies in the different branches of the two systems. From some source in the body there is continuous stimulation of both antagonistic systems. Smooth muscle structures are continuously receiving stimuli from both systems.

The innervation of the esophagus is accomplished through the recurrent laryngeal and the lower portion by fibers of the vagus. It is believed that no sympathetic fibers are supplied to the esophagus. Food in the esophagus excites a muscular reflex, causing the muscular tone of the stomach to relax. The tonus of the stomach remains balanced through the combination of the vagus and sympathetic. The cardiac portion of the stomach is supplied through the vagus alone. For instance, the symptom of fullness is a frequent and persistent complaint made by many patients.

The sensation of fullness after a full meal marks a normal satiety and denotes normal physiological distension, but fullness after a meager and insufficient meal

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*Read before Southern Gastro-Enterological Association, Meeting Conjointly with the Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

means disturbed innervation. The esophageal reflex prepares the tonus of the stomach for the incoming meal. If now, through too great stimulation to the cardiac area, the muscles are overtaut a false feeling of satiety exists, though there may be an entire lack of normal food-distending elements present. The innervation of the stomach is accomplished both by the vagus and sympathetic, and the latter fibers are most generously distributed to the pyloric portion.

Here is another interesting observation that the neuro-muscular element furnishes. Many gastric symptoms have their origin in gastric atony. Atony is caused by a relaxation of the circular muscular fibers and its site of predilection is the pars media and the pyloric portion of the stomach, which are most generously supplied by the sympathetic nerve system. Hence, overstimulation of this system must be held accountable, as sympathetic stimulation always produces relaxation of smooth muscle.

The small intestine is supplied both by sympathetic and vagus, the latter having fibers from the plexi of Auerbach and Meissner which lie in the intestinal walls. Stimulation of the vagus here again causes increased peristalsis and increased secretion. The sympathetic fibers of the intestine are derived from the great splanchnic nerve formed by fibers arising in the fifth to the ninth thoracic segments. When the greater splanchnic is stimulated, the muscular coat of the intestine is relaxed and secretion is depressed. The descending colon, sigmoid and rectum are supplied through the pelvic nerve. The sphicters of the gastro-intestinal tract are activated by the sympathetics, which is a fact of clinical significance.

Eppinger and Hess have brought out the fact that there are certain individuals who have a susceptibility to sympathetic hyperirritability and vagus hyperirritability whom they designate as sympatheticotonics and vagotonics respectively.

The general syndrome of sympathetico-tonia is: nervousness, irritability, easy excitation, large eyes and dilated pupils, rapid heart action, smooth, dry, highly colored skin, dry mouth, slow digestion, insufficient secretion and constipation. Injection of adrenalin increases the symptoms. The vagotonics show a more phlegmatic tendency, thick, moist, clammy skin, sweating of localized areas, salivation, bradycardia and arhythmia, states of gastro-intestinal over-tonus and hypersecretion.

The injection of pilocarpin increases symptoms. As we are more concerned with the gastro-intestinal expressions, I wish to take these up in more detail. The stimuli of the sympathetic system are toxemias and mental states, such as fear, anger and worry and possibly a hormone. As examples of toxemic sequelae, there are the gastro-intestinal atony and hyposecretion of late tuberculosis, typhoid and influenza. Cannon's experiments on the effect of fear and anger upon inhibiting digestion are familiar illustrations. The clinical significance of these facts is to emphasize the importance of seeking the sources of over-sympathetic stimulation after having established its effects. The subject of atonic constipation is a study in itself. It is probably the most important symptom of over-sympathetic stimulation of long duration. Here we have to do with an undue relaxation of the circular muscular fibers. Therapeutically, we must remove the sources of infection and apply measures to re-establish intestinal tone. Though the main characteristic of the sympathetics is to inhibit, they activate the sphincters of the alimentary tract. The type of constipation associated with the internal anal sphincter is to be considered.

The gastro-intestinal expressions of vagotonia are more striking and definite. A frequent symptom is free salivation, and according to Eppinger and Hess, the vagotonic never has a dry mouth. Another frequent symptom that these people complain of, is of food sticking in the throat. They have almost an anesthetic pharynx and experience not the slightest difficulty in taking a stomach tube. Esophagospasm and cardiospasm are typical of vagotonia and are due to periodic over-tonus. Pressure in the epigastrium frequently occurs, probably explainable by over-tonus. Hyperchlorhydria is nearly constant in all cases giving rise to pain. This, too, is accompanied by hypersecretion.

Gastro-succorhea, or Reichman's disease, is characterized by periodic and copious secretion of gastric juice with nausea and vomiting. These attacks last two or three days and suddenly disappear, the individual enjoying freedom from discomfort between the attacks. Pylorospasm is most probably under vagus control, though its exact innervation has not been determined. It appears often in vagotonic individuals.

Physical examination rarely elicits a succussive splash. The x-ray signs are rather characteristic in vagotonia, namely, hypertonic type stomach, deep peristalsis, retention of the barium meal in the fundus, pylorospasm, and sometimes impressions as of an hour-glass stomach.

Expressions of vagus hyperirritability in the intestines are few, as functional tests of the jejunum and ileum are difficult. However, there is evidence to show increased peristalsis and shortened emptying time. A nervous diarrhea is explainable as a stimulation of the longitudinal muscle fibers. Stimulation of circular fibers is productive of constipation. X-ray signs in the colon are often characteristic and are of several types. There may be an increase in the diameter of the ascending colon, or the haustra or clearly defined and the entire lumen narrowed. There is a type in which the entire colon is empty and barium is found in the sigmoid and rectum.

Spastic constipation is a frequent expression of vagotonia, the transverse and descending colon appearing highly hyperspastic. The stools are scanty with small scybala, and covered more or less with mucus. Many of these cases have mucous colitis. Pilocarpin, which increases vagus susceptibility when given to rabbits, causes an evacuation of large amounts of glairy mucus.

The gall bladder and ducts and pancreas are supplied with both sympathetic and vagus fibers. Vagus stimuli to the gall and pancreatic ducts are productive of spastic states. Sympathetic stimuli give rise to diminished biliary and pancreatic secretion.

In the following ten cases of vagotonia I wish to present briefly a few of the outstanding features.

Case 1.—A man, 35 years old, had a pulse rate of 68. The blood pressure was 100-70. The chief symptoms were epigastric oppression, precordial pains and constipation. The gastric analysis was as follows: oz. 2; free HCl 62; total 78.

Case 2.—A boy, aged 17 years, had a pulse rate of 69 and blood pressure of 116-60. His chief symptoms were fullness, localized sweating and cold hands and feet. The test meal resulted as follows: oz. 5; free HCl 56; total 68. The roentgen findings were pylorospasm and spastic colon.

Case 3.—A male, age 38, had a pulse rate of 64 and blood pressure of 95-80. The chief symptoms were fatigue and constipation. The test meal gave: oz. 4; free HCl 26; total 58. The roentgen finding was pylorospasm.

Case 4.—A male, age 44, with a pulse rate of 68 and blood pressure of 130-75, had as his chief symptom palpitation. The test meal gave: oz. 3; free HCl 66; total 82. The roentgen finding was pylorospasm.

Case 5.—The chief symptoms of a man 31 years old with pulse 64 and blood pressure 115-70 were choking, precordial pain, fullness, constipation, sweating and cold hands and feet. Test meal was: oz. 2; HCl 42; and total 48. The roentgen examination was negative.

Case 6.—The chief symptoms of a man 23 years old with a pulse 64 and blood pressure 130-80 were smothering, precordial pain, fullness and palpitation. The test meal gave: oz. 2; free HCl 60; and total 72. The roentgen examination was negative.

Case 7.—A male, age 23, with pulse 68 and blood pressure 100-75 had as his chief symptoms fullness and palpitation. A test meal gave: oz. 2; free HCl 32; and total 70. The roentgen examination showed a pylorospasm.

Case 8.—A male, age 29, pulse 64, blood pressure 110-64, had as his chief symptoms fullness, constipation, mucus in the stools, palpitation, sweating and cold hands and feet. The test meal gave: oz. 6; free HCl 42; and total 60. The roentgen examination was negative.

Case 9.—A male, age 17, pulse 60, blood pressure 120-105, had as his chief symptoms burning and fullness. The test meal gave: oz. 3; free HCl 58; and total 76. The roentgen examination showed pylorospasm.

The following case I wish to report more fully, as it is quite typical. A man 28 years old had had an appendectomy and cholecystostomy three years before coming to me. The symptoms at the time were of ten years' duration. They were chiefly fullness and intermittent attacks of weakness and faintness, which belching relieved. He thought that eating caused gas. He had had an aching sensation at times around the heart for years. He had a choking sensation on swallowing liquids. His hands were frequently moist and his bowels were constipated. The test meal gave: oz. 6; free HCl 64; and total 78. The roentgen examination showed active peristalsis and spastic colon.

You will note that all of this series are males. The average pulse rate is 64. The blood pressure readings vary from normal to hypotension. A striking characteristic in nearly all cases is the subjective symp-

tom of fullness. In explanation, recall the distribution of the vagus to the fundus area of the stomach. Vagus hyperirritability in its interference with the esophageal reflex possibly is responsible for the symptom. Constipation is present in 7 cases, mucous colitis in 1 case, and regular stools in 3. The test meals show a predominance of hyperchlorhydria, with excess content in 6. The outstanding roentgen finding is the frequency of pylorospasm and spastic colon. They occurred in 6 cases.

Feilchenfeld, in a paper in *Deutsche Medizinishe Wochenschrift,* reports 25 cases of vagotonia, which he divides into 4 groups, as follows:

(1) Acute vagotonia, 10 cases, symptoms being chilliness, dizziness, pain in the head, nausea and vomiting, with pulse rate of 40 to 52.

(2) This group he classes as chronic vagotonia, and reports 8 cases. The symptoms of weakness, sweating and obstinate constipation were present.

(3) Paroxysmal tachycardia (vagus weakness), 3 cases.

(4) Acute vagotonia with cardiac weakness, 4 cases.

A discussion of the abnormal states of the vegetative nervous system would not be complete without mention of the strong probability of the influence played upon it by the over-secretion or under-secretion of one or more of the ductless glands. Many investigators, for instance, have demonstrated that the suprarenals, the thyroid and the hypophysis stimulate the sympathetic system and that the ovaries and pancreas increase the activity of the vagus.

From the standpoint of therapy, it is quite logical that gastro-intestinal disorders which have abnormal functional conditions of the vegetative nervous system as a background can be treated more rationally through the knowledge of the modus operandi of such conditions. Toxic foci must be eradicated. Mental and psychic states must be corrected. Endocrine dysfunction must be recognized.

In the treatment of vagotonic conditions, atropin is almost a specific. In acute vagal attacks it is to be given hypodermically in 1/100 grain doses. In chronic conditions, 1/150 grain in solution is indicated. Ext. belladonnae in 1/4 grain doses can be used over long periods with much benefit.

CONCLUSIONS

(1) The balanced innervation of the sympathetic and vagus nervous systems maintain the normal function of the gastro-intestinal tract.

(2) Both sympatheticotonia and vagotonia give rise to certain definite syndromes of abdominal symptoms.

(3) Rational therapy lies in such measures as restore the normal innervation of the involved structures.

DISCUSSION

Dr. J. E. Knighton, Shreveport, La.—We see numerous cases of hyperchlorhydria and hypersecretion that we cannot account for through the pathology of an organ other than the stomach. In many cases of hyperchlorhydria we have cholecystitis and other conditions with their reflex stimulation of the nervous system, where we get this result.

I was glad to hear Dr. Fitts refer to the use of atropin and belladonna to correct the troublesome symptoms resulting from this condition. Many cases of hyperacidity can be corrected by diet alone. Others get no relief from diet and alkalis, but the addition of belladonna gives prompt relief.

Dr. Sidney K. Simon, New Orleans, La.—The attempt to base clinical studies upon the overbalancing of these two types of vegetative nerve function was started by Eppinger and Hess five or six years ago. Some very interesting clinical points have been called to our attention by the contemplation of these studies. The condition we call vagotonia means that the vagus invasion has over-balanced the sympathetic invasion. An attempt to base diagnosis upon the over-balancing of either one of these functions is sometimes liable to lead us astray, especially as to the reason of the unbalance.

The endocrine glands play a large part in determining these studies. I recall a case that in the early stage of our knowledge of this subject appeal to me as a typical instance of sympathetico, that afterward turned out to be disturbance of the thyroid function. Other disturbances of the endocrine glands have a part in these conditions. Mistakes in diagnosis will continue to be made and important factors will be overlooked, and I want to urge a little caution from the clinical standpoint in not stopping at the diagnosis of vagotonia or sympatheticotonia, but looking a little further into the causes that lead up to these disturbances of the vegetative nerve functions.

SYPHILIS OF THE COLON*

By J. P. Keith, M.D.,
Louisville, Ky.

This is a subject upon which we find very little in literature, most of the authors including it in a general topic of syphilis of the digestive system with a few lines only on syphilis of the colon. In *Annals of Medicine*, July, 1920, Dr. Karschner reports three cases with a very thorough discussion on this subject. We believe from our experience that syphilis of the colon is not so rare as search in the literature would lead one to believe. We wish to report the following cases, as we believe they will give some insight into the difficulty met with in the diagnosis of syphilitic lesions of the colon, especially in the differential diagnosis.

Case I.—B. M., age 40, had a rather definite history of chancre 20 years previously with probably inadequate treatment as judged by the patient's statements. Later the patient married and consulted his physician about some minor ailments and related the above history to him. At this time he was given some specific treatment for a short while, but the patient, on feeling better, failed to return for further treatment.

During June, 1920, the patient on a trip away from home was rather ill for several days with vomiting and nausea, but recovered sufficiently to return home, when he again consulted his physician, giving some vague digestive symptoms. He was given the usual purgative and in a few days was able to resume his duties. His physician says that he probably did not give this man's statements as to the vomiting due consideration, as he (the physician) thought the attack was probably occasioned by over-eating. The patient was a Jew and most of their race are given to large meals.

Early in September a similar attack was ushered in, a little more pronounced with persistent vomiting for several days. At this time he was referred to an internist and on September 20 we were asked to make a gastro-intestinal examination. We found in the lower descending colon what we supposed was a very long fibrosed stricture probably luetic in origin. A Wassermann at this time showed 4-plus. The patient had lost 30 to 40 pounds in weight. He was given extensive anti-luetic treatment and immediately began to improve and gain in weight, was very comfortable on a guarded diet and was soon about his usual duties. At the time of this examination some difficulty was met with in cleansing the tract of the barium.

Again in December the patient was a little indisposed. A few days after the usual purgation and rest he was feeling well again, but at the request of his physician was again given a barium enema to determine if treatment had made any change in the supposed stricture. At this time the stricture was seemingly improved. The enema did not pass readily and the patient had a very rocky time for several days, but after a few weeks again resumed his duties. In March, 1921, symptoms of an obstruction became very pronounced and the abdomen was opened. A large mass was found binding down the lower end of the descending colon and the entire sigmoid with rather dense adhesions to the abdominal wall. No attempt was made at removal. No section was taken for microscopical study. A colostomy completed the operation with a macroscopical diagnosis of malignancy. The patient died several weeks later from exhaustion and a post-mortem was refused.

Case II.—A. F. C., age 41, one year previously began having trouble with gaseous distension of the colon and constipation, which gradually became worse, and on one or two occasions he had a partial obstruction. He was examined by us in June, showing structure in the lower portion of the sigmoid with a great deal of spasm throughout the sigmoid and lower descending colon. At this time a Wassermann reaction was 3-plus positive. Since that time he has been under specific treatment and has gained 12 pounds in weight, though constipation, gaseous distension and occasional bleeding at the stool has persisted.

In July was seen by Dr. Ochsner, who believed the stricture was due to specific origin. Later a proctoscopic examination made by Dr. Hanes revealed some fixation at the upper portion of the rectum with bleeding on friction, on which evidence he made a diagnosis of malignancy and has been persistent in this belief.

On October 27, he was operated upon by Dr. Irvin Abell and a large tumor mass was revealed at the recto-sigmoid junction with a loop of the ileum adherent to the mass. Numerous little nodules were scattered throughout the iliac mesentery and on to the adjacent peritoneum. A section for microscopical study was taken from the iliac glands and parietal peritoneum and the site of the tumor mass. The pathology report by Dr. Graves is as follows: The specimen consists of four small bits of fatty and grayish tissue, not hard. Rush diagnosis is inflammatory. There are two small bits of tissue, one of which appears to have some tiny grayish deposits and to be firmer than the first two portions. Opinion of growth *in situ* is carcinoma of the sigmoid. Microscopical description: two sections show atypical growths of pale vacuolated cells in very delicate, scanty stroma, somewhat like mucous areolar tissue. The grouping and association of this picture with colloid carcinoma in previous cases strengthens the opinion that the lesion is colloid carcinoma of the large intestine.

Case III.—L. D., age 41, had three brothers and one sister living in good health, and no history of acquired syphilis. This patient had rather indefinite digestive symptoms with some vomiting. A roentgen examination showed the same strictured condition as the two cases reported with positive Wassermann. Under specific treatment clinical symptoms markedly improved for some time.

At present this patient is in the psycopathic ward of the City Hospital with all the classical

*Read in Section on Radiology, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

late symptoms of syphilis. An attempt to secure a plate a few days ago was a failure, as only a few ounces of enema were retained.

Warthin states the matter thus:

"There is no infection which is so constitutional or generalized as syphilis. There is no other one of the most important human infections that in its later stage is more internal and less a dermatologic disease than syphilis."

The excuse, if any, for this paper is to make an appeal to the general practitioner and to the internist to give all cases of indefinite digestive symptoms at least the time for a thorough examination that they may not later be chagrined by a diagnosis of syphilis. The patient may thereby be saved valuable time and the possibility of great damage being done. With the possibilities of a latent syphilis in every patient being ever present with us in our examinations we may find more of these cases earlier than heretofore and in time to render aid to them. We wish to make a special appeal to the roentgenologist ever to have in mind in his routine work that syphilis can cause irregularities in the colon and that perhaps to us is given the opportunity to elevate this subject to its proper importance in the realm of medicine.

Our main difficulties in diagnosis are between malignancy and tuberculosis. In syphilis the patient usually has the comparatively elongated smooth stricture which may or may not be multiple, the stricture usually presenting a smooth appearance caused by the fibrosis in contra-distinction to the irregular filling defect of malignancy. In syphilis we have comparative absence of pain and the Wassermann reaction as adjuncts to the diagnosis. However, it is possible for a gumma with ulceration to give a very similar plate to the irregular deformity of a malignancy.

SYPHILIS AND TUBERCULOSIS

In Brown's very comprehensive study of tuberculous colitis* he finds that 85 per cent of the cases occur in the cecum and ascending colon, while in syphilis the majority of lesions occur in the transverse and descending colon. In tuberculosis there is an absence of filling of the cecum and ascending colon or at most a very irregular ragged shadow if barium is retained at all. In the syphilitic colon the bowel fills, but with a rather smooth and elongated stricture as a rule except in case of ulcerated gumma. The tuberculous cases are always secondary to a pulmonary tuberculosis, while the syphilitic are secondary to a general luetic infection.

It would seem from the ending of this report that all my cases of syphilis of the colon are proving to be malignancies. However, I believe these to be true primary syphilitic lesions and, as we know, a large mass in the pelvis as described in the first case might be a large gummatous mass, and this would give a microscopic picture very similar to a malignancy. In the second case the microscopist has a hesitancy in his report about the malignancy of this mass.

*American Journal of Roentgenology, Vol. 6, p. 625.

DISCUSSION

Dr. A. L. Gray, Richmond, Va.—I recall very distinctly a gentleman who presented a definite stricture of the sigmoid upon whom we made a barium examination. We were satisfied he had a stricture. This was several years ago, before routine Wassermanns were done, and at first in this particular case a Wassermann was considered unnecessary. The stricture was dilated, but in the course of a year or more an operation was performed. Then for the first time a Wassermann was made and found to be four-plus. I think a partial resection was done at that time. However, just last week the gentleman was again returned for further trouble and we found that he had practically a complete obstruction that had developed within ten days previous to the examination: that is, an acute condition had developed. He was operated upon a couple of days afterward and a colostomy had to be performed. He had a large mass, but the exact extent of the involvement could not be made out by reason of our absolute inability to get enough of the barium enema through the stricture. I have seen three or four cases in which I was willing to venture a positive diagnosis of syphilitic stricture. One of these was entirely relieved by systemic dilatation with bougies. He was given anti-syphilitic treatment with permanent recovery.

As to the probability of a carcinoma resulting from a syphilitic lesion of the colon, I am thoroughly satisfied that such has often been the case. I can see no reason why such a condition should not develop, but I have had no cases in which I was able to demonstrate syphilis at one time and carcinoma at another.

Dr. Charles H. Nims, Hot Springs, Ark.—Within the past year I have observed three cases of sigmoid stricture which were carcinomatous, all in young people under thirty-five. The cases presented no other unusual peculiarities. It strikes me that this is rather a large percentage occurring just at the pelvic brim, considering the number of other cases of stricture of the colon which I have observed. One of these cases was a high school boy of seventeen. These obstructions are not unusual.

Dr. Allan Eustis, New Orleans, La.—One word of warning to the x-ray man coming from the

internist, on account of two experiences in my own practice in which a diagnosis of malignancy of the sigmoid was made and at operation diverticulitis with adhesions and exudate was found. I have heard no mention of this and we should keep it well in mind.

Dr. John B. MacRae, Asheville, N. C.—My experiences are in line with those of Dr. Eustis. Recently a case that had been operated upon under the diagnosis of carcinoma of the rectum came into my hands. It turned out that in the center of the growth there was a small bone. The man had been eating quail, had swallowed a piece of bone and a growth had developed around it. The x-ray pictures were quite similar to the pictures thrown on the screen. I have seen also a case of tuberculous colitis or tuberculous involvement of the lower sigmoid in which a greatly infected area of the gut was removed. It was not unlike those cases under discussion.

There are many cases of syphilitic diverticulitis that can confuse one. They must be left to the decision of the pathologist and the clinician.

Dr. Charles L. Martin, Dallas, Tex.—In considering filling defects in the large bowel, there is one differential point that often proves valuable. Syphilis appears in the sigmoid and rectum in the great majority of cases, whereas tuberculosis is most common in the cecum and ascending colon.

I should like to ask Dr. Keith whether he has found it difficult to differentiate the long, ribbon-like constrictions produced by chronic ulcerative colitis from some of the more extensive lesions that he has shown us. The symptoms are probably quite different in the two conditions, but at first glance there seem to be some points in common between the x-ray appearance.

Since the diagnosis of these colonic conditions is so difficult it seems to me that we, as roentgenologists, should merely describe what we see and state that the appearance is consistent with syphilis, where we feel that the findings point in that direction. The appearance is often consistent with other diagnoses as well.

Dr. James J. Clark, Atlanta, Ga.—I have seen two cases like these, one of which proved to be syphilis of the colon. That differed a little from the pictures thrown on the screen. The stricture was at about the level of the sigmoid and occupied seven inches. Instead of having a dilatation of the bowel the colon presented about the same appearance as a chronic colitis. The stricture was not complete. It narrowed down to index finger size. One point of interest was the extent of the involvement, seven inches without obstruction. I felt that if it was malignant we should have an obstruction earlier with the infiltration extending up along the bowel. In one case the condition cleared up very quickly under luetic treatment. The other case is a recent one and it is too early to say what will happen.

Dr. B. W. Fontaine, Memphis, Tenn.—I wish to report a very interesting case of what is apparently syphilis of the cecum. This patient is a man fifty years of age. He was brought to me because of pain in the right side and a very severe secondary anemia. The x-ray plates after a barium enema showed a very ragged cecum, with a marked filling defect. The Wassermann reaction was four-plus and remained so after fourteen doses of arsphenamin. The man has apparently not been benefited at all by the most intensive treatment with arsphenamin intravenously, mercury intramuscularly, and by inunctions, and also potassium iodid. The question comes up as to whether cases of syphilis of the colon are curable with anti-syphilitic treatment, and yet remain Wassermann fast. In this case, which is apparently syphilis, there has not been any improvement with the most intensive treatment, despite the fact that the man has had this mass without much progression for the last three years. We now believe that the case was syphilis of the colon in the beginning, and that there has been a secondary implantation of carcinoma. So far as I know, there was only a slight retention of the barium meal and the barium enema. The Wassermann test has been made by several workers. In one instance it was made in the Barnes Hospital, St. Louis. There is no question about its being positive in the beginning, but there has been no disappearance of the positive Wassermann and no improvement of the condition under treatment. We are now transfusing him, with the hope of getting him into condition for an operation. The thought occurs to me whether an x-ray man can always differentiate carcinoma of the colon from syphilis. Personally, I do not believe he can. If we throw aside the Wassermann test and other laboratory findings, it is difficult to tell the two conditions apart.

Dr. M. M. Roland, Oklahoma City, Okla.—Our experience has been that a pathologic differentiation between the syphilitic and malignant cases has been very unreliable. In making a differential diagnosis the Wassermann test and the usual signs of malignancy all come into the differentiation before any other means we have at hand. We have had some experience, not in the bowel alone, but in other portions of the body in the treatment of malignant conditions combined with syphilitic conditions and our experience is that they are very obstinate. I recall an old epithelioma of the temple which, under ordinary circumstances, should offer no reason for not getting well. Yet this man carried a 4-plus Wassermann that has been reduced to negative on several tests, and still we cannot get a complete cure of the malignant condition.

Dr. Keith (closing).—I do not see why we could not have carcinoma as a secondary consideration with syphilis as the primary lesion. In these two cases reported I believe the patients had primary syphilitic strictures followed later by carcinomatous degeneration.

I do not believe we should be called upon to make a definite diagnosis of syphilitic lesion from the x-ray standpoint. The Wassermann and other tests should be taken into consideration. Both these cases at the time of operation macroscopically did not show so much stricture as you would be led to infer from the picture. In one case there was a large mass in the pelvic cavity and in the sigmoid with adhesions; in other words, it looked larger under anesthesia than the plates showed and as shown by our slide.

My only plea to these men who are doing x-ray work is to be more careful in the routine work to look not for a tube-like colon that we see, but one that has the appearance of having the walls thickened from syphilitic deposits.

SURGERY

RAILWAY, INDUSTRIAL, GYNECOLOGICAL, OBSTETRICAL AND UROLOGICAL

THE SURGERY OF THE GALL-BLADDER WITH AN ANALYSIS OF FIVE HUNDRED AND TWELVE CASES*†

By W. H. Goodwin, M.D., F.A.C.S.,
University of Virginia,
Charlottesville, Va.

The present regime of the University of Virginia Hospital has been in existence since September, 1907, and from that time till October 15, 1921, there have been performed 512 operations upon the gall-bladder and bile ducts. I have excluded all cases diagnosed gall-tract disease but not operated upon, all cases in which gall-tract disease was found in the course of other operations and not treated, and all those cases explored in which the gall-tract disease was found to be inoperable. These operations have been done by the Professor of Surgery, his associates and the resident surgeons, making a total of seven operators. The University of Virginia Hospital is a general one and rooms are provided for private patients as well as public wards for white women and men and wards for negro women and men. There are on an average one-fifth more women than men admitted on the surgical service and two and six-tenths times as many white patients as there are colored patients admitted on the same service. While the number of cases in this series is not a large one and cannot be so valuable as reports from some of the larger clinics, I hope there will be some points of interest presented.

Gall-bladder disease has a universal incidence, attacking all classes of people, and so far no success has been attained in its prevention. It is to be hoped that as a result of more alertness in the discovery of focal infections and the early eradication of them the incidence of gall-bladder disease will be materially reduced. The theory that it is of infectious origin seems now universally to be accepted and that the causative bacteria are carried in the circulation. They set up, in most instances, a hepatitis, and then pass to the gall-bladder producing a cholecystitis.

Rosenow has well demonstrated the peculiar selective properties of certain bacteria and has shown that the streptococcus is the most common organism in the production of inflammations of the gall-bladder. He is inclined to think that in those cases where the colon group of bacteria are found in the bile tract inflammations, they are secondary to a primary streptococcus infection. Rosenow has demonstrated that streptococci which have a marked specificity for the gall-bladder will not produce inflammation when injected directly into the lumen of a healthy gall-bladder, but will produce a cholecystitis when injected into the blood stream. There seems to be little evidence in favor of infection of the gall-bladder taking place by regurgitation of lymph and still less evidence of there being an ascending infection from the duodenum through the bile ducts, since the sphincter muscle of Oddi and the oblique manner in which the common duct enters the duodenum prevent this occurrence. The duodenum will rupture under pressure before its contents will regurgitate into the common duct.

The fact that inflammation is usually in the head of the pancreas has been cited as evidence in favor of the infection coming from the bile duct, but Rosenow shows that streptococci having an affinity for the pancreas, will produce inflammation in the head of the

*From the Surgical Clinic of the University of Virginia Hospital.

†Read in Section on Surgery, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

pancreas when injected into the blood stream.

Mann has demonstrated the peculiar selective properties of certain chemicals by injecting Dakin's solution intravenously and noting severe grades of inflammation in the gall-bladder.

Gall-bladder disease is essentially one of middle and advanced age, and in this series the average age is 41.9 years.

AGE GROUPS

Between the ages of 10-20 there were 12 cases
Between the ages of 21-30 there were 104 cases
Between the ages of 31-40 there were 115 cases
Between the ages of 41-50 there were 135 cases
Between the ages of 51-60 there were 107 cases
Between the ages of 61-70 there were 36 cases
Between the ages of 71-80 there were 3 cases

The youngest case in the series was a girl 16 years of age and the oldest was a man 72 years. Forty-eight and eight-tenths per cent of these cases occurred between the ages of 31 and 50 years. One case, not included in this series, was operated upon for an appendiceal abscess and before the abscess was attacked, the gall-bladder was palpated and stones were found. This was a white girl 15 years of age and the mother of two children.

Gall-bladder disease occurs much more frequently in women than in men, the ratio usually being given as 4 or 5 to 1. Of 512 cases in this series, there were 438 women and 74 men, a percentage of 85.5 for women and 14.5 for men. There are 12 women to 10 men admitted on the surgical service of the University of Virginia Hospital.

Kelly states that 8 per cent of women have gall-stones. Shroeder says that in Germany autopsies show 20 per cent of gall-stones in women and 4.4 per cent in men. W. J. Mayo affirms that 90 per cent of women with gall-stones have borne children.

This difference in the incidence of gall-bladder disease in the two sexes is difficult to explain with absolute satisfaction. But a more sedentary life, greater liability to constipation, the pregnant uterus causing pressure on the bile ducts, the increased function of the liver during pregnancy, infection of the female pelvic organs, visceroptosis due to relaxed abdominal walls tending to distort the bile ducts and create stones, and the hypercholesterinemia of pregnancy, each and all certainly must have some etiological relation, directly or indirectly, to gall-bladder disease.

Some women associate their first gall-stone attack, and often subsequent ones, with pregnancy. This was not at all a conspicuous finding in our series. One patient definitely states that she was quite free of attacks during pregnancy, but would begin having them after each delivery.

Pregnancy undoubtedly has an etiological bearing upon the incidence of gall-bladder disease and in this series of 438 women, 304, or 70 per cent, had borne children. Many of them who came from the rural districts and mountains of Virginia had large families. The average number of children borne by these women was 4.7.

It is quite important that every case should have a searching history taken and the historian should pay particular attention to gall-bladder and gastric disturbances in all gynecological patients. According to Peterson, gall-stones will be found in 10 to 15 per cent of gynecological operations.

The gall-bladder should be palpated whenever the abdomen is opened provided the operator has not encountered infection and the patient's condition will permit this procedure. Peterson says that gall-stones left at the time of other abdominal operations will give symptoms in 30 per cent of cases.

As an etiological factor in the production of gall-bladder disease typhoid fever has held, in the past, a prominent place, but quite less prominent at the present time.

It will be an interesting observation to note how much effect the inevitable decrease in typhoid fever, due to better sanitation, education and vaccination, will have upon the incidence of gall-bladder disease in the future.

There were 113, or 22 per cent, of our patients who gave a history of having had typhoid fever, and gall-bladder disease was given several times as a complication of the typhoid fever. This 22 per cent, I feel sure, does not repre-

sent quite all the patients who had a typhoid history because some of the records do not mention this disease.

A careful history should be taken relative to foci of infection.

Undoubtedly constipation and its attendant increase in intestinal bacterial flora, and portal congestion, predispose to gall-bladder disease, aids in precipitating the first attack and tends to aggravate any pathological condition in the gall-bladder:

CONSTIPATION

Definitely constipated	251, or 49 per cent
Definitely not constipated	105, or 20 per cent
Slight constipation	102, or 19 per cent
No record	54, or 10 per cent

In this series of 512 cases there were 59 negroes, a percentage of 11.5. There are 26 whites to 10 negroes ordinarily admitted to the surgical service.

While some of our patients entered the hospital suffering from the initial attack, the majority of them gave histories of several years' duration and either came in during an acute, recurrent attack or in the interval.

The diagnosis of those presenting themselves in the initial attack of acute cholecystitis or gall-stone colic is not usually a difficult one to make. With pain and tenderness in the epigastrium and right hypochondrium and possibly at the tip of the right eleventh rib, accompanied by nausea and vomiting, possibly fever and an increase in the leukocyte count, we most likely have an acute cholecystitis, without or with stone.

The presence of a stone usually adds colic, characterized by a sudden, severe, agonizing pain in the epigastrium and right hypochondrium, quite often radiating to the right shoulder blade. With the nausea and vomiting there are frequently prostration, weak, rapid pulse and sweating. A plug of mucopus may block the cystic duct, producing colic even though no stone be present.

Should the patient come during an acute recurrent attack or during an interval, a careful history will usually bring out the above symptoms and signs. Some patients are quite free of any discomfort between acute attacks, while others suffer from chronic indigestion between times.

Another class of patients have never had an acute attack of cholecystitis or gall-stone colic, but have been suffering for a variable length of time from what has been called chronic gastritis, dyspepsia or indigestion. Some give a history quite suggestive of gastric or duodenal ulcer, with hyperacidity. Some cases simulate cancer of the stomach with hypoacidity, while others appear to suffer from chronic appendicitis. The diagnosis in this last class of patients is rarely made without reservation till the patient has an acute attack or submits to an exploratory operation.

Jaundice may mean a stone is blocking the main duct, that inflammation has occluded the main duct, or that a distended gall-bladder is compressing the common duct. Inflammatory induration and cancer of the head of the pancreas are usually attended by jaundice.

Jaundice coming on insidiously, in a patient of middle life or beyond, increasing continuously, is quite suggestive of carcinoma of the head of the pancreas. Jaundice is usually accompanied by disagreeable itching and adds greatly to the operative risk, particularly if of long standing.

Laboratory tests are of little value, except in a negative way, in arriving at a diagnosis of gall-bladder disease; and the Meltzer-Lyon procedure seems to be of more therapeutic than diagnostic value.

The most enthusiastic roentgenologists claim to be able to demonstrate stones in 50 per cent of instances, while those more conservative claim only 20 per cent of positive results. There are a few roentgenologists who claim to get definite, well-recognized shadows in 25 per cent of cases of disease of the gall-bladder when no stones are present.

We have not relied upon the use of the x-ray in diagnosis of gall-stones, but feel quite a degree of satisfaction when a definite shadow is shown.

For convenience of study the cases in this series were divided into three classes:

(1) Those which had severe symptoms.

(2) Those which had mild symptoms.

(3) Those in which gall-bladder disease was found in the course of other abdominal operations, chiefly gynecological.

In the first class there were 360 patients, or 70 per cent. In the second class there were 90 patients, or 18 per cent, and in the third class there were 62, or 12 per cent.

The duration of symptoms in the first two classes averaged 4.8 years, ranging from a few days in the acute cases with their initial attack to thirty years in the interval cases, or the cases that came in with an exacerbation of a chronic gall-bladder disease.

Thirty per cent of these cases gave a history of duration of symptoms from 5 to 30 years. It is our custom to palpate the gall-bladder whenever the abdomen is opened for any condition provided it will not add to the danger from shock or the spread of infection.

In this series, gall-stones were found and removed in 62 patients who came to laparotomy for other conditions, chiefly gynecological.

During the first half of the period during which these operations were done cholecystostomy was the operation of choice, but since that time the tendency has been to do more and more cholecystectomies.

Of these 512 operations, there were 232 cholecystostomies, 210 cholecystectomies, 33 cholecystostomies with choledochostomy, 34 cholecystectomies with choledochostomy, and 3 choledochostomies.

Undoubtedly there are indications for cholecystostomy, but I am sure this operation should be done less often than it has been done in the past.

A gall-bladder that contains stones is most likely diseased and one having been the seat of an acute or chronic cholecystitis. To drain and leave this gall-bladder only invites recurrence. Certainly recurrences will take place whether cholecystostomy or cholecystectomy has been done, but I am sure fewer recurrences take place if the gall-bladder is removed.

The injury that has already been inflicted on the bile ducts and the hepatitis and pancreatitis set up by the infection will no doubt occasionally be the cause of disagreeable and distressing symptoms whether cholecystostomy or cholecystectomy has been done.

Our records show that of these 512 patients, 30 had had previous gall-bladder operations; 23 had had cholecystostomies done; 2 had had cholecystostomy and choledochostomy done; 3 had had cholecystectomy done; and 2 had had cholecystectomy and choledochostomy done.

I am aware that there will be more secondary operations done after cholecystostomy than cholecystectomy, partially because in the former, with recurrence, we still have a gall-bladder to remove.

Fistulas between the gall-bladder and duodenum were found 7 times and between the gall-bladder and colon 3 times.

Acute pancreatitis was recorded 12 times, and chronic pancreatitis 22 times.

I feel sure that a mild degree of pancreatitis existed many more times than the records show and palpation of the pancreas should be part of a systematic exploration in gall-bladder surgery.

Cholecystectomy is a more difficult operation than cholecystostomy and there are cases in which the surgeon meets with such difficulties that injury to the bile ducts is inevitable. The vast majority of these injuries, I feel sure, are due to errors in technic, or forgetfulness of the anomalies of this region.

In this series the common duct was cut twice. End-to-end anastomosis was done with success in one instance and in the other the proximal end of the distal segment was ligated and the distal end of the proximal segment anastomosed to the duodenum with success.

To determine the final result of operation in this series a questionnaire was sent, first to the patient, next to the nearest relative of those who did not reply, and finally aid of the doctor who

sent the case was solicited. By this means 424 patients, or 82.8 per cent, were traced. Thirty-seven of those traced are dead from various causes.

FINAL RESULT

	Operation							
	Cholecystostomy	Per Cent	Cholecystectomy	Per Cent	Cholecystostomy & Choledochostomy	Per Cent	Cholecystectomy & Choledochostomy	Per Cent
No. of cases	172	.....	166	.....	21	.....	28	.....
Well	123	71.5	145	87.3	13	61.9	23	82.1
Improved	40	23.2	15	9.	3	14.2	3	10.7
Unimproved	9	5.2	6	3.6	5	23.8	2	7.1

There were 30 patients who died in the hospital; and if we include all of them, there is an operative mortality of 5.8 per cent.

The causes of death in case of those who died in the hospital were as follows:

Myocardial insufficiency	3
Pneumonia	6
Gangrenous ruptured gall-bladder and peritonitis	5
Exhaustion	7
Necrosis of pancreas	1
Pulmonary embolism	2
Sarcoma of liver	1
Cholecystitis and uremia	2
Abscesses of liver and necrosis of common duct	1
Persistent vomiting	2
Total	30

If we omit one sarcoma of the liver, one extensive necrosis of the pancreas and one with multiple abscesses of the liver and necrosis of the common duct, both of whom were moribund on admission, and three extremely ill people with gangrenous ruptured gall-bladders and peritonitis, the operative mortality of this series is 4.8 per cent.

The average number of days spent in the hospital after operation was as follows:

Cholecystostomy	26.9 days
Cholecystectomy	22.7 days
Cholecystostomy and choledochostomy	28.8 days
Cholecystectomy and choledochostomy	29 days

There have been twenty cases of primary carcinoma of the gall-bladder admitted during the same period that this series of 512 cases occurred. On exploratory laparotomy 15 of these patients were found to have inoperable conditions and five were operated upon in the following manner:

One underwent cholecystectomy and resection of the transverse colon. Stones also were found. One had a partial cholecystectomy. Stones were present and the growth had invaded the liver. One had cholecystectomy and stones were present. Two had cholecystostomies where stones were present.

Primary carcinoma of the gall-bladder is not a rare disease as shown by the 3.8 per cent incidence in this series and is more often found in women than in men. The ratio is usually stated as 4 or 5 to 1, but in this series there were 18 women to 2 men, making a ratio of 9 to 1. It is much more frequently found in people past middle life and in this series the average was 57 years of age. The youngest person in this series of 20 gall-bladder carcinomas was a woman of 35, in whom the disease progressed rapidly to a fatal termination.

Undoubtedly the constant irritation of gall-stones in a diseased gall-bladder has a very important bearing upon the production of cancer. In all of the cases upon whom cholecystostomy or cholecystectomy was done, stones were demonstrated. In 10, or 50 per cent, of these 20 cases, gall-stones were found upon operation. They might well have been present in some or all of the others, but due to the inoperable nature of the growth they could not be palpated.

Cancer arises in any part of the mucous membrane of the gall-bladder and microscopically may present the appearance of adeno-carcinoma, solid celled carcinoma, or more rarely, squamous celled carcinoma.

Unfortunately, early carcinoma of the gall-bladder does not give symptoms definite enough for a positive diagnosis. Often this disease is insidious and painless in nature and when the patient

comes for examination or operation the condition is found to be inoperable. It is regrettable that carcinoma of the gall-bladder and other abdominal viscera is not always attended by severe pain in the beginning when the patient would be compelled to seek relief with a much more favorable prognosis.

The operative mortality in these 20 carcinoma cases was nil, but of those traced the final mortality is 100 per cent.

The differential diagnosis of carcinoma of the head of the pancreas is often impossible to make before the abdomen is explored. Even though inoperable cancer here is strongly suspected, we are quite justified in doing an exploratory laparotomy with the idea of diverting the bile stream around the obstructed common duct, thereby giving the patient temporary relief, many times, from the jaundice and disagreeable itching.

While the cases were not included in this series of 512 gall-bladder cases, the gall-bladder has been anastomosed to the stomach four times and to the duodenum once. It would seem more logical to anastomose the gall-bladder to the duodenum than the stomach, but in four of these cases the stomach was selected because of greater accessibility, and to have anastomosed the duodenum would have caused kinking.

Mayo advises that the common duct be ligated in connection with cholecystogastrostomy and cholecystoduodenostomy because of the possibility of the common duct becoming temporarily patent and allowing the anastomosis to close.

The operative mortality in case of cholecystostomy in this series was 5 per cent and in cholecystectomy 3.3 per cent. It is quite true, however, that cholecystostomy was the operation of choice in a few cases where the prognosis was very poor and the more formidable operation of cholecystectomy was thought to be unwise.

Of the patients traced who had cholecystostomy done, 71.5 per cent were cured, 23 per cent improved, and 5.2 per cent unimproved. Of those who had cholecystectomy done, 88 per cent were cured, 9 per cent were improved, and 3 per cent were unimproved.

No one should dogmatically say that cholecystectomy ought to be the operation of choice in all gall-bladder disease; but on account of the better immediate and final results and the shorter and more comfortable convalescence of cholecystectomy I believe that operation should be done in the vast majority of cases. Deaver says that 65 per cent of recurrences can be prevented by removal of the gall-bladder. Cholecystostomy certainly has a field of usefulness in the very ill patient with infected gall-bladder complicated by jaundice. In the very ill patient with stone in the common duct and deep jaundice, cholecystostomy may be relied upon to tide the patient over the emergency and later the stone can be removed with much less risk to the patient.

Crile emphasizes the importance of slow drainage in the very ill, jaundiced patient by suturing a tube in the gall-bladder, or common duct, if the condition necessitates this latter procedure and establishing a fluid-tight system of drainage by clamping the tube and releasing the clamp at frequent intervals.

The jaundiced case frequently has a very much delayed coagulation time and Crile advises that a transfusion of blood or an intravenous infusion of 0.2 per cent calcium chloride be given previous to operation and that this procedure be repeated after operation.

DISCUSSION

Dr. J. Shelton Horsley, Richmond, Va.—These statistics point out the value of statistics in a large hospital where records are accurately kept. Impressions are frequently erroneous. However, the general view held by surgeons as to the value of cholecystectomy and cholecystostomy is borne out by the figures of Dr. Goodwin. His figures upon the occurrence of cancer are also interesting. So far as he could tell, there were gall-stones in practically every case of cancer—certainly in every case of cancer of the gall-bladder in which the gall-bladder was removed. This substantiates the claim that gall-stones cause irritation and so produce cancer.

Another type of cholelithiasis is found in the patients not jaundiced and having good renal capacity. These are not much of a problem. A skillful surgeon can usually handle such cases very well. The worst cases are those with

bile tract infection which has lasted for a long time and with cholemia in addition. Here the mortality is high even in the best hands; and in hands not so good it is appalling.

It seems to me there are two definite things to do: first, relieve the infection; and, second, relieve the jaundice. Relieving the infection depends upon the conditions found. If there is a large stone in the common duct when the patient is thin and the incision ample, it would probably be conservative to remove the stone. Under other conditions, if the obstruction is above the head of the pancreas, I believe it would be better to do no more than a simple exploration that would show the lesion and then anastomose the gall-bladder to the stomach. It is very difficult to anastomose the gall-bladder to the duodenum in just this type of case. By making a small incision first and then enlarging it as necessary the pyloric end of the stomach comes into view. If the gall-bladder is dilated the bile can be drawn off and the operation done with very little trauma and very little pain, and it will drain the bile into the gastro-intestinal tract. Dr. Halsted, of Baltimore, has emphasized the importance of not having a long drainage of bile externally, but draining it back into the gastro-intestinal tract. It seems to make little difference whether it is drained into the pyloric end of the stomach, which is almost constantly washed with bile, or into the duodenum. The important thing is that it should be drained into the gastro-intestinal tract where the contents are sterile, never into the ileum or colon, where the contents are septic. The walls here are thick and the anastomosis is a comparatively simple operation.

Dr. W. A. Bryan, Nashville, Tenn.—The point as to whether child-bearing influences the presence of gall-stones in women depends upon the percentage of women of the age of forty who have given birth to children. I do not know what that is. If more than 90 per cent of women at the age of forty have given birth to children, it seems that would diminish the tendency to gall-stones. The influence of typhoid is a thing in which we are likely to make a mistake on account of the old belief. It is very difficult really to know whether a patient has had any typhoid or not. Those of you who try to take accurate histories know what I mean by that. It is definitely established that patients who have not had typhoid fever have gall-bladder trouble.

As to x-ray examinations, I was glad to hear the essayists say that they were not in the habit of depending upon x-ray findings for the diagnosis of gall-stones. If the findings are positive they help, but if negative they mean nothing. Some advocates think you can find the soul with x-rays if you put them in the right place. Another thing is that some of these patients who have no stones are as desperately ill as are those who have stones. What we want to do is to find out whether the gall passages are responsible for their condition.

Another thing is important from the operative standpoint in connection with gall-bladder disease. We have been taught, correctly, that a patient who has jaundice is likely to have a slow coagulation time, that it tends to increase hemorrhage. That is true, if he has had his cholemia for only a short time. But if cholemia has been present for any length of time you will frequently find an exceedingly rapid coagulation time. Sometimes it is only one or one and a half minutes where the jaundice has been present for weeks or months.

Kocher once said that gall-stones belong to the patient and if he wants to keep them he has a right to do so. Of course, from a legal and moral standpoint that is true, but from the doctor's standpoint it is wise to let him know just what he is keeping. If a patient has definite, clear-cut gall-bladder trouble, satisfactory evidence that there is disease of the gall-bladder, and somebody says not to do anything until there is another attack, we then must wait. The patient is asked, "Have you had any jaundice? Have you had this or that? Better wait." I think it is exceedingly important, if we can do the right kind of service and dodge the evil consequences so clearly set forth in Dr. Goodwin's paper, that we should impress upon our patient's mind that just as in appendicitis and other diseases the treatment should be given while times are good instead of waiting to make it a hopeless kind of surgery to snatch the patient out of the grave.

If the patient knows that a stone in the common duct is much more serious than stones in the bladder, and if he knows that he can be operated upon much more safely when there is no jaundice than after jaundice has been present for a long time, he will be much more inclined to submit to operation. If he knows that cancer of the gall-bladder is preceded by stones in 98, 99 or 99½ per cent, some say 100 per cent, of cases, and if the patient understands that the keeping of gall-stones favors this consequence, I think he will not be willing to keep them any longer than necessary.

Dr. H. G. Sloan, Cleveland, Ohio.—We have recently been impressed with the fact that we lose so many operated cases during the second and third day. Some of them die from infection, but this is rare. They usually complain of being tired and go out with an ascending pulse and respiratory rate. The patient's breath has an odor half way between uremia and intestinal obstruction. We used to call this, in the hospital, our graveyard odor. We have learned to associate this with the breaking down of the liver cells. This was called to our attention in the case of a doctor in whom we did a drainage of the gall-bladder, suspecting cancer of the pancreas. We found at the autopsy that he had an acute yellow atrophy. He had a slight evening delirium, with increasingly rapid respiration and consequent death.

In gall-bladder surgery death is due to several factors. We all recognize now that a gall-bladder infection is only a part of the cholangeitis that involves all parts of the liver. The factors are: infection, gall-stones and the obstruction of an excretory gland added to a liver which has borne the brunt of a long life. In addition, if we further insult our patient with a deep ether

anesthesia we know that we further damage the secretory properties of the liver cells.

The principles we lay down are these: as little insult as possible with our anesthetic. Nitrous oxid is the least harmful. We use local blocking wherever we can, or do it under local with the patient talking to the anesthetist all the time, with as little trauma as possible so that healing may be kindly after operation. If symptoms develop that are alarming, frequently we find that glucose solution intravenously will tide them over. But the crucial factor on which survival depends is whether the liver cells have been too badly damaged to be able to synthesize the amino acids into urea: in other words, whether the liver can take care of normal waste products arising from the body's protein breakdown.

Dr. LeRoy Long, Oklahoma City, Okla.—In most cases we should depend upon the clinical symptoms and signs in arriving at the diagnosis of disease of the gall-bladder and bile tract area. However, during the last eleven months I have been very much interested in a laboratory test that might be of some service in obscure conditions.

The test referred to was described by Fernand Widal, the Widal who gave us the test for typhoid fever, and two of his associates, Abrami and Iancovesco, in an exhaustive article published in *La Presse Medicale* on December 11 last year. In this article the authors call attention to what they believe is a newly recognized function of the liver, designated by them the proteopexic function (*fonction proteopexique*). They start out with the statement that through a number of investigations upon animals it has been demonstrated that partially digested protein material may cross the intestinal barrier and enter the portal circulation and through it reach the liver. It is pointed out that in the normal animal such material is fixed or transformed by the liver so that it does not, in its original form, reach the general circulation. But if the liver is diseased this protein fixing function is interfered with, the imperfectly digested protein material enters the general circulation by way of the hepatic vein, and the entrance into the general circulation is followed by a vasculo-sanguine crisis characterized by a marked reduction in the number of leukocytes, a lowering of the blood pressure, shortening of the coagulation time and a reduction of the refractive index of the serum. The most important and significant phenomenon is the reduction in the number of leukocytes.

The experimental work was done on dogs. The dog was fed meat or other protein food, after which either an anastomosis was made between the portal vein and the inferior vena cava, or blood was drawn from the portal vein with a syringe and injected into the general circulation. Immediately there was a profound reduction of the number of leukocytes, frequently to the extent of one-half. In the control animal this did not occur, there being, on the contrary, an increase in the number of leukocytes as normally occurs in the healthy animal after food is eaten. It is understood, of course, that in all cases the leukocytes were counted before as well as after giving food. Furthermore, it was found that in the fasting state neither this nor the other phenomena mentioned followed the introduction of portal blood into the general circulation.

In its clinical application, it is the acme of simplicity. The leukocytes are counted, the blood pressure taken, the coagulation time determined, the refractive index of the serum ascertained, after which the patient who must have been without food for not a shorter time than five hours, is given a small amount of protein food, usually 200 c. c. of milk. Twenty minutes afterward the leukocytes are counted and every twenty minutes thereafter for about an hour. Usually, if there is disease of the liver interfering with the proteopexic function, there is a very marked drop in the number of leukocytes in forty minutes, frequently in twenty minutes, together with the other phenomena mentioned which occupy a place of secondary importance, and, for practical purposes, can be omitted. After the first hour there is usually a gradual return to the normal leukocyte count, the normal being reached before two hours. It seems clear, therefore, that the crisis is not due to the presence of the animo acids because these bodies are not found in the intestinal tract so soon after taking food.

At the University of Oklahoma School of Medicine we have been investigating this test for about eleven months, and we believe that it is of considerable service in certain gall-bladder and bile tract conditions with atypical history and symptoms. A report is in course of preparation and will be published soon.

To illustrate the type of case in which it is of value, I shall refer briefly to one patient who entered the hospital with remarkably obscure symptoms. There was a mass in the right abdomen which the surgical side thought was a Riedel's lobe, probably associated with a cholelithiasis, notwithstanding the meagre findings. The medical side did not agree. The proteopexic test was done, and in forty minutes the leukocyte count dropped from 8500 to 5000. Operation showed a cholecystitis with stones.

This question is interesting in view of the liver pathology associated with gall-bladder pathology. It is now generally agreed that in connection with gall-bladder disease there is frequently a widespread cholangeitis involving the radicles of the duct system in the liver. As to just how infection reaches the gall-bladder, all are not now agreed. The theory promulgated by Gilbert and his co-workers thirty years ago, that organisms are taken up from the intestinal tract by the radicles of the portal vein, carried to the liver, become attenuated, reach the gall-bladder in the bile and there initiate a low-grade inflammatory process, causing exfoliation of epithelium from gall-bladder mucosa, groups of these epithelial cells becoming nuclei around which cholesterin crystals are deposited, thus forming gall-stones, is today a reasonable theory with a substantial basis. In no other way can I understand the cases that exist for many years, there being often large numbers of stones in the

gall-bladder, without extensive destruction of its walls. Be that as it may, there is manifestly much associated liver pathology in gall-bladder and bile tract disease, and through such pathology there is doubtless an inhibition of the proteopexic function. It is for this reason that I suggest the tentative employment of the test devised by Widal and his associates in the class of patients that I have referred to.

Dr. W. W. Grant, Denver, Colo.—Surgeons are prone to lay too much stress upon the purely operative feature of our work and too little upon the importance of the clinical history. Therefore, we have many good operators, some good surgeons and few good diagnosticians. We have given too little consideration to the clinical history and too much to laboratory findings in diagnosis.

Surgeons and pathologists differ as to the cause of this infection. We are familiar with the work of Rosenow, that the infection is through the blood stream and often from a pre-existing focus. Others claim it comes through the lymphatics and still others claim it comes through the bile ducts. We are devoting most of our time to the operative features of cholecystectomy and cholecystostomy. I believe there is a constitutional vice which plays an important part in these infections. I was interested to hear Dr. Sloan say that the cholemia often preceded the gall-bladder infection, and that no operation cures this constitutional condition. I have observed that many cases are in fat women and men past forty years of age. The tissues are soft and they seem common to the lymphatic class. Whether this has anything to do with the formation of cholesterin I cannot say, but this type of individual seems to be predisposed to gall-bladder infection and gall-stone disease. We are inclined to lay too much stress upon a new thing and to remove gall-bladders when the condition would be better treated by drainage. I do not doubt that most chronically involved gall-bladders are better treated by excision. I believe it better to leave the removal to a secondary operation when many gall-stones are present. A secondary operation is often due to overlooked stones in the ducts. Drainage at this time would perhaps make a secondary operation unnecessary and be less embarrassing to the surgeon, because not infrequently a large stone, which was small at the previous operation, was not removed. In gall-bladders and ducts with many small stones we are never sure they are all out, and in these cases I believe that temporary drainage is the best procedure and often is all that is necessary. I also believe that pancreatitis is always favorably affected by drainage.

Dr. Evarts A. Graham, St. Louis, Mo.—The important consideration is not the gall-bladder, but the liver and pancreas. These latter organs have functions which are so important that they constitute "vital" organs. We cannot live without either one of them. The gall-bladder, even in its normal condition, has a function which is insignificant in comparison with that of the liver and the pancreas. The importance of the consideration of the liver and pancreas lies in the fact that in every case of cholecystitis the liver and pancreas are both affected. In 1918, I called attention to the constant association of a hepatitis with a cholecystitis. There is also good reason for thinking that there is the same constant association of pancreatitis with cholecystitis. Any consideration of the treatment of cholecystitis, therefore, gets down to a consideration of the best methods of preserving the functions of the liver and pancreas, because there is now much evidence which shows that an infection of these organs may occur probably as a constant result of cholecystitis and not merely as an antecedent of cholecystitis.

Recently we called attention to the importance of the lymphatic origin of cholecystitis. There is an abundant anastomosis between the lymphatics of the gall-bladder and the liver which has been worked out by Sudler. These same lymphatics also connect with the lymphatics of the common duct and the pancreas. It is possible to show that the lymph stream goes in either direction; thus it may travel from the liver to the gall-bladder, or, vice versa, from the gall-bladder to the liver. We can see at once, therefore, that the possibility exists of a vicious circle between the liver and an infected gall-bladder by which one constantly re-infects the other by direct lymphatic spread. If infections of the gall-bladder were limited to the mucosa, we might expect to break up this vicious circle by simple drainage of the gall-bladder. In by far the majority of cases, however, the infection is more pronounced in the deeper layers of the gall-bladder and in many cases, which show a pronounced infection of the deeper layers microscopically, there is no demonstrable involvement of the mucosa. This fact suggests at once that necessarily drainage of the gall-bladder can be expected to accomplish little if any good except of course in those cases in which there is an obstruction of the cystic duct. It indicates also that since the gall-bladder is a relatively avascular organ and very similar in anatomy to the appendix, it is probable that a gall-bladder which has really become infected will result in a chronic infection. The vicious circle, therefore, to which we have already alluded can best be broken up by removal of the gall-bladder. There is, of course, no denial of the fact that some cases of cholecystitis recover after simple drainage of the gall-bladder. There are also some cases of appendicitis which recover spontaneously, but, since we do not know in a given case whether recovery will take place or not, I believe that the usual procedure should be removal of the gall-bladder just as now the usual procedure in appendicitis is removal of the appendix.

As to the pathogenesis of cholecystitis, no one has a higher regard for Rosenow than I have, but I do not believe that it is necessary to interpret the majority of cases of cholecystitis accoring to Rosenow's ideas. It is easier to explain most cases of cholecystitis in a much more simple way. For example, every one knows that cholecystitis is likely to be associated with another inflammatory lesion of the portal system as, for example, appendicitis, peptic ulcer, ty-

phoid, suppurative hemorrhoids, etc. If we think of these various conditions producing a hepatitis by transfer of virulent organisms through the portal vein of the liver, then in accordance with all known laws of infection elsewhere in the body we would expect this inflammation to spread by way of the lymphatics. Because of the intimate anastomosis between the lymphatics of the liver and the gall-bladder, we should be surprised not to find some evidence of cholecystitis in any case of hepatitis. Furthermore, because of its spread to the gall-bladder by way of the lymphatics, the inflammation would of necessity involve the outer layers of the gall-bladder more than the mucosa because it is here that the lymphatics enter the gall-bladder. Direct experimentation bears out this comparatively simple idea. Cholecystitis can be produced very readily in animals by injection of a radical of the portal vein with virulent bacteria. The old idea that cholecystitis results from a washing of bacteria down in the bile from the liver does not seem to be a satisfactory explanation for two simple reasons: first, if that were true, then the mucosa ought to be more affected than other parts of the gall-bladder, an inference which is not in harmony with findings in human gall-bladders removed at operation. Second, it is almost impossible to produce cholecystitis experimentally by a simple inoculation of bacteria into the lumen of the normal gall-bladder.

The necessity, therefore, of treating a coexistent lesion of the portal system is clearly shown. As a matter of routine we always remove the appendix at the same time that we remove the gall-bladder.

Dr. I. G. Duncan, Memphis, Tenn.—One phase of this that I have heard very little about is infection of the kidney following an infection of the gall-bladder. In my urological work often I see patients with pyelitis following some infection and it is not infrequent to find it in the gall-bladder. In my surgical cases I have found quite a large percentage of gall-bladder cases with an associated pyelitis. I think this is one of the complications, and many times the cause of death, because the symptoms are not only overshadowed by the gall-bladder lesions, but it is overlooked and underestimated. I have also found that bad teeth and bad tonsils and appendicitis are by far the most frequent predisposing causes. If one operates only upon the gall-bladder one will have a hepatitis and the patient will probably go to somebody to finish up. The habit of operating upon them and turning them loose is all wrong. They should be dieted and instructed as to the sanitary way of living, and we should see that the bowels and liver are looked after. If we do we will get a higher percentage of cures.

Dr. Goodwin (closing).—I have heard no one bring out any points regarding technic. We employ, in cholecystectomy, drainage with a small cigarette drain and close very few without drainage. Quite a number of surgeons are reporting good results in cholecystectomy without any drainage at all. We are fearful that the increased pressure in the bile ducts after a cholecystectomy may tend to force off the ligature of the cystic duct.

It was interesting to note in Dr. Horsley's remarks that in the cases where the gall-bladder was anastomosed to the stomach there was no trouble afterward from jaundice or vomiting. I think this is usually a much better procedure than trying to do a cholecystoduodenostomy.

While we do not give undue emphasis to typhoid fever as a cause of gall-bladder disease, the incidence in this series was rather large. It is quite likely that some of these illnesses called typhoid fever were improperly diagnosed by the patient or the physician in charge. An error like this, however, is impossible for the historian to overcome.

One point in the paper was illustrative of a carcinoma developing in the gall-bladder and the abdominal scar where a cholecystostomy had been done one year previously for cholecystitis and gall-stones.

I have not been impressed by the gall-bladder's being a focus of infection for kidney lesions, but can easily see how it could act as such a focus.

I was interested in the discussion of Dr. Sloan concerning the function of the liver, and while I did not bring out the point Dr. Crile has emphasized concerning the harmful effects of any lipoid solvent anesthesia, I agree with him that operations upon the bile tract should be done, so far as possible, under local and nitrous oxid-oxygen anesthesia.

AN ANALYSIS OF ONE HUNDRED AND SIXTY CASES OF OSTEOMYELITIS WITH END RESULTS*

By J. S. Speed, M.D.,
Memphis, Tenn.

The cases upon which this report is based were taken from the private practice and hospital service cases of myself and of Dr. Willis C. Campbell, of Memphis, Tenn.

The series does not include osteomyelitis following compound fractures or gun shot wounds. Many cases had been operated upon elsewhere previously. However, the final treatment has been under the direction of one man, which makes the series particularly valuable. No attempt has been made to summarize the operative treatment, as it is in many cases too indefinite to be of value. The general operative plan has been

*Read in Section on Orthopedic Surgery, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

conservative in the acute cases: incision and drainage of the soft parts and trap door drainage of the medullary canal; radical excision of all diseased bone and sequestra in cases where the time of election could be chosen for the secondary operation, this being after the acute infection had subsided, sufficient involucrum had been thrown out to support the continuity of the shaft, and the sequestra were well demarcated. In the chronic cases where there was a definite sequestrum present, this was removed and the adjacent medullary canal explored. When there was simply a massive thickening and eburnation of a large part of the shaft, with no definite sequestrum, but with sinuses or severe pain to show that active disease was still present, the problem of how much or how little to do has always been difficult. A wide exposure of the entire diseased area, with complete removal of all obviously diseased bone, conversion of pockets and tunnels into saucer-shaped basins and exploration of the medullary canal, or its remains, for sufficient distance to be sure of its condition, has been the usual procedure.

The etiology, pathology and clinical course of the disease has become so well understood since the publication of Nichol's excellent monograph on the subject, that it will be only briefly dealt with in this paper.

Osteomyelitis may be divided into two main groups, localized and diffuse, similar in some respects but differing so widely as to interest and prognosis that they will be separated here. The localized type will be briefly summarized and disposed of so that it will not complicate the consideration of the latter type.

Of the one hundred and sixty cases, twenty-nine were of the localized type and twelve in the upper or lower jaw, arising from peri-apical dental abscess, all occurring in adults. Four were in the tarsals, three in the phalanges, four in the ribs, two of which gave a pure culture of typhosus and two staphylococcus aureus. Three were in the tibia and one in the humerus. Only six of these cases occurred under the age of fifteen years. All were readily cured by thorough curettage and removal of the localized diseased area in the bone.

DIFFUSE OSTEOMYELITIS—131 CASES

This is essentially a disease of youth, 80 per cent of the cases occurring before the age of fifteen years and 70 per cent between the ages of eight and fourteen. It occurs at the age when bone activity and growth are at their height. The lymphoid tissue of the nasopharynx is also functionally very active at this period and with our present knowledge of focal infections it is not a far drawn supposition that here may be a frequent portal of entry for the infecting organism.

Trauma is often undoubtedly the inciting cause. How often it is impossible to say, as in every instance a history of some injury of greater or lesser degree can be obtained in an active child.

The bacteriology is chiefly of interest in the acute cases before the skin has been broken, as after this secondary infections are the rule and any organism that inhabits the skin may be found.

Bones Involved.—The long bones of the extremities are apparently particularly susceptible to attack. Of the one hundred and sixty-six bones involved, 40 per cent of the lesions were in the tibia, 35 per cent in the femur, 7 per cent in the humerus, 7 per cent in the radius and ulna and 2 per cent in the fibula, a total of 91 per cent for these six bones. In 21 cases, or 16 per cent, the disease was multiple, two or more bones being involved.

Location of the Infection.—Considerable difference of opinion existed in the past as to whether the infection was primary in the medulla or the periosteum. It is now generally accepted that the medulla is the primary focus of the infection, the process spreading along the endosteum of the haversian canals to the cortex and periosteum. The x-ray studies and operative findings in this series are both strongly in favor of this view. In only two cases in the entire series is there evidence to suggest that the disease was primarily a suppurative periostitis and these are both open to doubt. Hence, it

is of vital importance at operation that at least a trap door opening be made through the cortex into the medulla, regardless of how normal the bone may appear. Both operative and x-ray findings support the theory that the ends of the diaphysis near the epiphyseal line are the parts of the bones first involved. The virulence of the infection being equal, the extent to which the remainder of the medulla and shaft are involved depends mainly upon two factors: first, the rapidity with which the cortical bone is destroyed, allowing the infection to drain through to the periosteum; and second, the strength of the periosteal attachment to the shaft, which is largely determined by the ligamentous and muscular insertions. The two most common locations of the disease illustrate well this point. Osteomyelitis of the upper end of the femur, arising near its three epiphyses and breaking through the cortex, is prevented from stripping up the periosteum and extending down the shaft by the firm ligamentous and muscular attachments around the trochanters and upper shaft. It can, however, find an easy exit along the neck and through its weak periosteum to the soft tissues of the thigh and into the hip joint. Hence it is that the upper end of the femoral shaft is rarely extensively involved and that the hip joint is one of the few that is frequently destroyed by a neighboring osteomyelitis.

The exact reverse of this condition exists in the tibia. Its entire anteriomedial surface is free from ligamentous or muscular insertions; and pus breaking through the cortex at the upper or lower end can more easily strip up the periosteum than break through it, thus depriving the shaft of its chief blood supply and allowing the infection to cause its death. The epiphyseal lines here, as elsewhere, form strong barriers against the spread of the disease and the infection finds drainage before the knee or ankle are involved.

A point worthy of mention is that in four of the chronic cases metastatic osteomyelitic foci have occurred in other bones well removed from the original site of the disease. Two of these have occurred following operation upon the original bone lesion and two simply during the course of prolonged drainage. This suggests the possibility of a selective affinity on the part of the infecting organism for attacking similar tissue and reproducing the original lesion. The regularity with which the ends of the diaphyses are involved in the acute cases with multiple lesions also suggests this idea. I hope to be able to report in the future some experimental work in support of this theory.

Osteomyelitis following simple fracture, where there was no break in the skin, has not been definitely observed in this series. In two cases, however, both in children, the history is very definite as regards the original injury's being a fracture, followed in several days by an acute suppurative process. At operation both cases showed a complete fracture of the shaft, one of the femur and one of the tibia. Both were of several weeks' duration with marked bone destruction and as there was no x-ray taken at the time of the original injury, positive proof is lacking and the cases cannot be reported as such.

The x-ray is an invaluable aid in the location of established foci, to show the presence of sequestra and for intelligent observation of the progress of the disease. It also helps greatly in determining when a sufficient supporting framework of involucrum has formed to allow the removal of the necrotic shaft without breaking the continuity of the bone. However, the x-ray has several very definite limitations, which it is necessary to be acquainted with to interpret plates correctly. First, acute osteomyelitis is in its earliest stage an infection of the medulla and will not give evidence of its presence until a sufficient amount of the calcified structure has been destroyed. This usually occurs in from two to ten days after the onset of symptoms. Hence a plate taken during this period is of conclusive value only when positive. A negative plate by no means indicates that the bone is free from disease. In rare cases of mild infections or of severe infections in ad-

ults, the true extent or even the presence of bone disease may not appear for a considerable time. Plates taken two months after the first symptoms in one case could easily have been interpreted as negative. This was a man thirty-six years old, with a typical onset of osteomyelitis of the right tibia eight weeks before admission to the hospital. Two weeks before admission an abscess of the calf developed. X-ray pictures taken eight weeks after the onset showed a slight general clouding of the upper shaft and early periosteal thickening on the posterior surface of the shaft, visible only on lateral view. Operation disclosed a very small opening on the posterior surface of the shaft, just below the epiphyseal line, through which pus was draining and moderate periosteal roughening was around this. When the medulla was opened there was a gush of yellow pus under considerable tension and practically the whole medulla was involved.

In old chronic cases with massive thickening, eburnation, and irregularity of a large portion of the shaft, it is easily possible that a small sequestrum, deeply buried in a pocket or in the remains of the medullary canal, will not be visible to the ordinary eye, even on a good plate. This brings up the last point. A fair plate will fail to show what a good plate will bring out clearly.

Primary Closures. — Primary closures with attempts at sterilization of the cavity and transplantation of muscle flaps to fill the defect have not proven of so much value as was anticipated. It was tried in only ten cases of this series, all selected because of the mild chronic character of the process which seemed to offer a fair chance of success. All cases were of over five years' duration. One had a discharging sinus and positive Wassermann. Four had small localized sequestra. Culture was positive for staphylococcus aureus in three. Seven cases healed per primum. Three were failures. Two of these gave a staphylococcus on culture and one had a skin slough, due to scar tissue.

The one hundred and thirty-one cases of diffuse osteomyelitis have been divided into the two commonly accepted groups, acute and chronic, a duration of three weeks being arbitrarily chosen as the limit for the acute cases.

ACCUTE DIFFUSE OSTEOMYELITIS: 21 CASES

The age of onset was under fifteen years in 90 per cent of the cases. A definite history of trauma was obtained in 55 per cent. Bacteriological reports were available in only twelve cases, eleven of which gave a pure culture of staphylococcus aureus and one a streptococcus. Blood cultures taken in three at the height of the disease, all gave staphylococcus aureus. The portal of entry can probably be assigned to skin infections in two cases, but in the vast majority no definite focus could be found, the lymphoid tissue of the nasopharynx being the most probable location. Lesions were single in seventeen and multiple in four cases. Twenty-nine bones were involved, nineteen of the foci being in the tibia and femur. The lower jaw, humerus and radius were the next most frequent sites.

In three cases the disease was fulminating in type. The patient had multiple lesions, was moribund on admission and died before the results of operative treatment could be judged. In the four cases which died several weeks after operation, the usual trap door drainage of the bone was done and the acute infection overcome. Death was due to the usual complications of a chronic sepsis. Of the fourteen who recovered from the primary attack, ten have been traced. The original trapdoor drainage was sufficient to effect a complete cure in three cases. In six, further operations were necessary for a cure, and one case which refused further operative treatment is still draining after two years. There were nine cures, seven deaths and five incomplete cases. The unusually large proportion of deaths is explained by the fact that only the most desperate cases were brought to the hospital during the primary attack. All the other acute cases fall into the chronic group by delay in seeking operative treatment.

CHRONIC DIFFUSE OSTEOMYELITIS: 110 CASES

Age of Onset.—Fourteen per cent were between the age of one and five years; 40 per cent, between five and ten years; 30 per cent, between ten and fifteen years; 16 per cent, over fifteen years. The youngest case was nine days old, an extensive osteomyelitis of the radius.

Duration of the Disease.—Statistics here show little of interest except that about 20 per cent of the cases presented themselves for surgical treatment during the first year of the disease, and 40 per cent between one and five years. It is also seen that those cases which were failures or which presented marked deformities were of long duration, usually over five years. The longest duration in this series was fifty years.

Bones Involved.—In the 110 cases, 146 bones were involved: the tibia in 40 per cent, femur in 35 per cent, humerus 7 per cent, radius 6 per cent, ulna 4 per cent, and the other 8 per cent were scattered over the rest of the skeleton, including the clavicle, scapula, pelvis and tarsals. The average number of operations performed in each case was three.

Results.—Cases reported as cured have had all sinuses healed and no recurrent attacks of pain or swelling in the affected part for a period of one year. I fully realize that no case of osteomyelitis can ever be pronounced positively cured. About 10 per cent of the cases in this series have been healed and free from symptoms of active disease at various times for periods of from six months to fifteen years before the recurrence which brought them in for operation. Function and deformity are not considered in the results, as we are dealing only with the infective process of the bone in this table.

Of the 110 cases, 26 are too early for final report, 14 could not be traced, 5 refused operation and are still draining, 1 refused operation and had the limb amputated elsewhere. This leaves 64 cases operated upon by us. Fifty-four cases, or 84.4 per cent, were cured. Nine cases, or 14 per cent, are still draining, some having only occasional flare-ups, and the function of the limb is so good that they refuse further treatment. One case died of sepsis following operation, giving a mortality rate of 1.5 per cent.

An analysis of the 13 cases still draining brings out several points of interest. All were of over five years' duration and eight were of over ten years. In five cases the tibia was the bone involved and in eight the femur, seven of these being in the lower third of the shaft. Four of the tibial cases have never had a radical operation, leaving only one case of osteomyelitis of the tibia which has received proper treatment and not been cured. All of the unhealed femoral cases have had at least one radical operation. The large percentage of cases with disease of the lower third of the femur in the uncured group can probably be explained by two factors: first, the relative inaccessibility of this portion of the shaft, both at operation and in the post-operative dressings; and second, the large amount of cancellous medullary bone lying just above the condyles, which makes difficult the complete removal of the necrotic bone without injury to the epiphysis. In six of the uncured cases small sequestra have worked out and nine have occasional attacks of severe pain. Occasional slight pain in a bone, which has been the site of an old osteomylitis, is a common occurrence and is of no significance. However, if the pain is severe, worse at night and of the constant boring type, it is of decided importance. Even if there are no signs of inflammation in the soft parts, there is probably an accumulation of pus backed up within the medullary canal. One case, a physician with an old healed osteomyelitis of the upper end of the femur, had been having pain of this type for over a year, often requiring morphin at night to obtain relief. He had been seen by many of the most prominent orthopedic and general surgeons in the country, and none had advised operation, mainly because the x-ray showed no definite cavities or sequestra in the massively thickened shaft and he was having no fever. An ex-

ploration of the bone was done and about two ounces of thick yellow pus were found in the remains of the medullary canal. An active growth of staphylococcus aureus was obtained on culture.

Records in this series do not favor the complete subperiosteal resection of the tibia, radius or ulna, even when practically the entire shaft is involved. Any loss of continuity in the shaft of the long bones is to be avoided, if possible. Defects of as little as one-half an inch, cause marked prolongation in the period of disability. Simple fractures through involucrum have all united much as ordinary bone does. Continuity of the bone was broken in 16 cases of this series; 14 cases in the tibia and 1 each in the ulna and radius. The ulna completely regenerated and there is still bony deficiency in the radius after fifteen years. In only 4, or about 29 per cent, of the tibial cases did complete regeneration take place. All of the cases in which the after-treatment could not be carefully supervised had some shortening and bowing deformity in the leg. Transplantation of the fibula and bone grafts between the ends of the tibial fragments was necessary to give a stable leg.

Permanent deformities requiring operative treatment for the improvement or cure were apparently much more frequent following osteomyelitis than is generally reported, occurring in 30, or 27.3 per cent, of the 110 chronic cases. The most common types were flexion contractures of the hip and knee, either with or without bony ankylosis; bowing, shortening and dislocation of the femur or tibia, and loss of continuity of the tibia with instability of the leg. An analysis of these will be taken up in a later paper.

DISCUSSION

Dr. Henry G. Hill, Memphis, Tenn.—The late Dr. Murphy told us that we should prepare a cavity in bone just as a dentist would prepare a cavity in a tooth for a filling. If that can be done, we can expect to cure chronic osteomyelitis. If a cavity in the bone is left with overhanging edges you cannot expect by curettage completely to eradicate the disease. Preparation of the cavity is probably the most important step in operation for chronic osteomyelitis.

In cases of acute bone infections, especially of the endogenous type, usually the patient is very sick when seen, and the mortality is high, unless drainage can be effected without delay. These cases have to be drained quickly, with very little trauma and very little shock.

The essayist did not mention supportive treatment in these cases, which I think is very important. Transfusion and other measures are frequently indicated.

I should like to ask Dr. Speed whether he has had experience with immediate sterilization in chronic infections. A radical operation has been described by Babcock for chronic or recurrent cases with sinus formation. His technic is briefly this: a careful pre-operative x-ray study is made. The sinuses can be fairly accurately mapped out by injecting them with bismuth suspended in iodoform emulsion, using considerable pressure with a syringe especially suitable for forcing the emulsion into all cavities communicating with the sinus.

At operation the infected soft tissues as well as the bone are carefully dissected away and the cavity swabbed with chlorid of zinc. The skin is closed with the fewest number of stitches possible and a moist peroxid of hydrogen dressing applied. The stitches are removed on the third or fourth day.

I wish to emphasize Dr. Speed's remark with reference to inserting drainage tubes or packing the wound with gauze. This should be done only in very exceptional cases.

Dr. W. B. Carroll, Dallas, Tex.—You will recall how Dr. Murphy urged immediate operation for a case of acute osteomyelitis. It was as imperative, he said, as in gangrenous appenditicis. In forty-eight hours, if you do not operate, there is complete destruction of the bone. This is good teaching if not entirely true. It is important to establish drainage immediately for acute osteomyelitis, but do not at the time attempt to do an extensive operation.

I see frequently at my home two patients upon whom I operated seven or eight years ago, one with marked abduction of the forearm due to the removal of a large part of the radius before sufficient new bone was formed. The other is a man with absence of three inches of tibia which I removed three months after an acute osteomyelitis. I thought enough periosteum and new bone remained to bring about restoration, but there was not. Dr. Murphy taught, and Dr. Speed emphasizes it again, that these cases of subacute osteomyelitis should drain until there is an involucrum strong enough to prevent deformity of the limb.

Dr. Isidore Cohn, New Orleans, La.—In osteomyelitis we have a disease which should be removed from the class of chronic disabling dis-

eases by an early radical conservative treatment. We should see these patients recover. By early radical conservative treatment, paradoxical as it may sound, I mean that we should make the diagnosis before the x-ray tells us anything. The x-ray will not tell anything until there is destruction or absorption of sufficient lime salts to cause a difference in the density of the two respective shadows. Prior to that time you should have sufficient evidence upon which to base a diagnosis.

In about 50 per cent of the cases there is an associated trauma. There is a history during the first twelve to twenty-four hours of a sudden rise in temperature and a localized pain over the shaft of one of the long bones. The patient may or may not have had a chill. There is redness over the shaft of the bone; and the leukocytosis sometimes ranging from 25,000 to 30,000, with a high polymorphonuclear count. Do not wait for the x-ray. Our operative procedure is one which diminishes the amount of traumatism incident to the operation. A free incision is made, the periosteum retracted, and three or four holes, more if necessary, are made by a motor-driven drill or bur. The holes are connected laterally, and the intervening plates of bone removed. Do not use the curette, because the curette opens the barriers which Nature has tried to throw around the medullary abscess. Osteomyelitis is primarily an intramedullary abscess. It is easy with a motor-driven instrument to do away with the possibility of fat embolism, the possibility of which we cannot overlook, if we make use of a gouge or mallet or any of these appliances. A motor-driven instrument should take the place in all of these cases and we should be reminded always of the possibility of fat embolism.

In a recent study made, in eight or ten cases of fracture out of a large series reported, the immediate cause of death was found to have been fat embolism.

Dr. Speed (closing).—I made no attempt to cover the subject of supportive treatment in this discussion of osteomyelitis. Transfusion is a great help in the desperate cases, particularly in those not in the acute stage but which go on to chronic sepsis with marked anemia and who are generally in bad shape.

We have been unable completely to sterilize osteomyelitis cavities in the bone or soft tissues at the primary operation and have given up attempts at primary closure, except in the mild selected cases.

Dr. Cohn's remarks about using a motor drill in preference to a mallet and chisel for trephine openings into the medullary canal to avoid the possibility of fat emboli were very interesting. Practically, however, we have never had any complications to suggest the occurrence of fat emboli in the routine use of the chisel.

SOME OBSERVATIONS ON PROSTATIC SURGERY*

By F. L. Carson, M.D., and E. L. Yeakel, M.D.,
Shawnee, Okla.

The last decade has witnessed so many marvelous advances in surgery that it can now be truly said that there is no area of the human body which may not be explored surgically. So rapid has the progress been that the average surgeon has found it almost impossible to keep pace with all of its phases.

While surgery of the prostate is far from new, the popularization and standardization of the removal of benign hypertrophy of this gland stands very high in the order of operations beneficial to mankind. It has taken poor old men whose existence was miserable, their days a torture and their nights a dread, whose lives were constantly endangered by acute retention and infection, and whose kidneys were slowly but surely succumbing, and placed them in the ranks where they may resume their vocations or spend their declining years in peace.

Speaking from our limited experience, we do not attempt to advance radical departures from standard operations, but rather give the results of our observations, working in a comparatively small city under conditions that many of you face.

Benign hypertrophy of the prostate with bladder infection naturally occupies the foremost position, as a great majority of our cases fall in this class. A patient rarely presents himself before he is infected.

Having determined that we are dealing with fibro-adenoma of the prostate and not a prostatitis, tabes dorsalis or malignancy, and that the bladder has been chronically over-distended, the first procedure must be a gradual withdrawal per catheter of the residual urine. But many of our cases come in after having had repeated attempts at catheterization, which have done no more than lacerate the urethra; and the immediate demand is to empty the bladder. It is in this that the greatest

*Read in Section on Surgery, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

danger of uremia lies. The sudden withdrawal of urine, acting in some unknown way, probably by disturbed circulation in the already damaged kidneys, causes a drop in the specific gravity, diminution in the amount of urine, coma and possibly death. We have lost two patients at this stage from a combination of the reason mentioned.

The two-stage operation has taken this class of surgery out of the ranks of the extremely hazardous procedures. We believe a preliminary supra-pubic cystotomy, under local anesthesia, to be the method of choice, as by this means the bladder is drained, infection combated, black pressure reduced and the kidneys are allowed to regain their function.

There now ensues a period in which we can carefully observe our patients, and consider the possibility of complications, such as pyelitis, diverticulum, calculus, tuberculosis and malignancy.

Since a great majority of all deaths following prostatectomy are due either to uremia, hemorrhage, shock or sepsis, we have a chance to put our patient in the best physical condition to combat these dangers. We observe the urinary output, phenolsulphonephthalein test and blood urea nitrogen, study the blood pressure and general condition of our patients and make our choice of anesthesia.

Against sepsis we must study the bacterial flora of the infected bladder of which the colon bacillus play an important part and against which little success has come from vaccine.

In our hands the supra-pubic route has proven the best, as diverticulum, calculus and hemorrhage can best be handled by this method. A preliminary cystotomy renders the subsequent removal possibly a trifle more difficult, but we believe it lessens the danger of infection of the prevesical space. We do not believe the perineal route has anything to recommend it to the occasional operator. In the hands of men like Young and his associates the mortality compares favorably with the supra-pubic method. Since carcinoma when discovered is probably not curable by operation, the radical procedure of Young is rarely justifiable. Radium, our only palliative, is easily introduced supra-pubically and is the only agent which is efficacious.

Complications in our hands rank in frequency as follows: pulmonary, sepsis, shock and uremia, with the cause of death most commonly toxemia or septic absorption. Epididymitis, pelvic cellulitis, wound infection and emboli are rare as the cause of death, but nevertheless are always to be guarded against.

The aged patient is first to fall victim to a complication either pulmonary, nephritic or toxic, or melt away from a slight persistent hemorrhage and shock. They seem to stand shock fairly well when it is unaccompanied by hemorrhage. At best the convalescence of the aged patient is slow compared with that of a younger man.

We have not had trouble with incontinence or complete retention following the supra-pubic method, and have found that a persistent foul pyuria is usually due to a diverticulum which has been overlooked. The painful and frequent urination often experienced after operation usually improves with time and often disappears.

If we make the last step in a supra-pubic prostatectomy a careful observation to see that we have done a clean job, that bleeding has stopped and that the vesical outlet is free from obstruction, especially from folds or tabs of mucous membrane, we have no need of a Hagner bag or pack except as a last resort. The in-dwelling catheter we rarely use because of post-operative discomfort and of the belief that it retards granulation and favors infection.

The one-step operation is our method of choice if the patient is in excellent condition with little or no infection, and if he has not been repeatedly catheterized.

Spinal anesthesia is again gaining in popularity.

SUMMARY

(1) The hazard of operation is less than the danger of repeated catheterization.

(2) One of the chief dangers in prostate work is the preliminary withdrawal of urine.

(3) In average hands the two-stage operation is the method of choice.

DISCUSSION

Dr. A. L. Blesh, Oklahoma City, Okla.—The principle mortality factors in old patients are, in the order of their frequency: (1) uremia, (2) hemorrhage, and (3) sepsis. Uremia has been avoided largely by the two-stage procedure, by careful blood analysis and by the renal dye tests.

Hemorrhage is only too frequently the cause of death. As ordinarily done, the operation is a blind one. The finger is thrust into the bladder, the prostate enucleated and a tube hurriedly inserted for drainage. Careful hemostasis is sometimes neglected for speed. Nothing is to be gained by sacrificing safety for speed, although it is recognized by all that these patients do not stand a prolonged operation. Nevertheless, it is necessary to accomplish a good exposure to visualize the field and control the hemorrhage directly if it exists. A bleeding vessel is far safer tied than compressed.

It is difficult at times to strike the direct line of cleavage. When not found, this will often prove the cause of severe hemorrhage. If the direct line of cleavage is adhered to, hemorrhage is not usually a serious source of danger.

It is well known that old people cannot long endure infections, even of moderate severity. The source of sepsis is to be found not only in the field of the enucleated prostate, but as often if not oftener in the freshly-opened space of Ritzius. In this cellular field thrown open to the contamination from an infected bladder, the patient often succumbs to a rapid sepsis which may be mistaken for shock. High temperature is not always to be looked for in old people. Indeed, often a subnormal temperature is associated with a sudden, overwhelming sepsis. Shock, as it occurs in prostatectomy, usually means hemorrhage. The author is to be commended for calling attention to the fact that sepsis is not likely to arise in the space of Ritzius in the two-stage operation, and if it does, the patient having but one load to carry, is able to survive.

It is to be pointed out that the patient who presents himself in good condition with no renal insufficiency is rarely a good risk for the one-stage operation. These very cases are the ones which often give us disagreeable surprises, because they are not immunized in any degree whatever. Those that have been suffering for a long time have vaccinated themselves against the infection they carry.

The essayist has pointed out the mortality-reducing factors in this formidable operation. The careful man will have several of these patients leaking in their homes, awaiting the final stage. Our instructions to them are to wait until they feel fit, are hearty, eat and sleep well, and then to return for the final stage.

Dr. J. A. Crisler, Memphis, Tenn.—There is as much or more in the after-attention to these old men as there is in the operation itself. They have to be nursed, cleansed, petted and tided over an indefinite period following their operation, if you expect them to get well. The general surgeon is not always prepared to do this properly. The after-treatment, if left to assistants, nurses and internes, is generally very improperly given.

We are being taught now that the operation for a prostatectomy should be as complete as that for tonsillectomy. If a small portion of the capsule is left to which may be attached the smallest particle of the gland, recurrence is almost inevitable. We are greatly surprised at times to find that the prostate has recurred, so to speak, a year or two following what we termed a complete prostatectomy. This fact alone should make general surgeons more careful in assuming the responsibilities of such an undertaking.

Dr. Irvin Abell, Louisville, Ky.—If one makes a free exposure of the prostatic bed for ligature of bleeding points, there is little need of any other control of hemorrhage.

Preparation is the most important thing in prostatectomy. The technic, whether one is accustomed to doing it supra-pubically or perineally, is about as perfect as we shall secure it. In the preparation, the 'phthalein test is not a sufficient indication of renal efficiency. I have seen this show a high output with a high retention of creatinin. Hence, when a man comes under observation with a high 'phthalein output, that alone casts suspicion that his renal output is below par. We have had other patients with a 'phthalein output of less than 20 per cent whose urea and creatinin tests showed little or no retention and who have undergone operation successfully.

I attach importance not so much to the type of operation, granting that you do it accurately and carefully, as to the proper preparation and after-care of the patient.

Dr. Yeakel (closing).—There is one observation that we have made that we did not call attention to in the paper, because I do not know whether it will stand the test of time. In cases with retention and chronic infection the first thing you notice upon opening the bladder and examining the trigone is that the ureteral orifices have lost their sphincter power. They are standing wide open. I have not seen much written about this. If they stand wide open it gives us an easy road for infection to the kidney.

The one-step operation is found most satisfactory in younger men, forty-five to fifty-five. There is usually no trouble with that type.

Dr. Abell's criticism of the 'phthalein test is well taken, for, after all, the blood urea and nitrogen test are more important.

THE PROBLEM OF CHRONIC INFECTION OF THE PROSTATE*

By A. Nelken, M.D.,
New Orleans, La.

Chronic urethritis, commonly known as "gleet," has long been the bugbear of those treating diseases of the male urethra, and its resistance to every therapeutic measure the despair of patient and practitioner alike. A celebrated pioneer in urology is credited with the statement that his idea of hell was a place where he would meet those whom he had failed to cure of a "clap." Almost every drug in the pharmacopea, to say nothing of many that have never been admitted to its sanctuary, have been tried either by mouth or by injection in the treatment of this condition.

One school, of which F. N. Otis was one of the most enthusiastic disciples, attributed all chronic urethral discharges to urethral stricture and popularized the wholesale cutting of urethrae, a line of treatment that has not even yet been entirely discarded. More careful study of the pathology of chronic urethritis showed that the urethral infiltration that accompanies this disease is rarely limited to sharply circumscribed areas, but is distributed throughout the canal, being especially marked about the follicles and lacunae. This fact is readily recognized through urethroscopic examination and has served to popularize the urethroscope both in the diagnosis and in the treatment of chronic disease of the male urethra. With this knowledge has come the general employment of sounds, and more especially of dilators in the treatment of urethritis. DeKeersmacker and Verhoogen,[1] whose book was published about 1897, would have one believe that all forms of chronic urethritis will yield to persistent treatment with the urethral dilator. It was the American translator who added the chapter on complicating infections of the prostate and vesicles.

In 1899, and again in 1901, Jordan Lloyd[2] called attention to the importance of involvement of the seminal vesicles as a complication of urethritis. Shortly afterward Eugene Fuller's[3] intensive study of the pathology of the vesicles proved the importance of infection of these organs in urethral disease. The study of prostatic disease was greatly stimulated by the attention given to these neighboring glands, and it was not long before so much emphasis was laid upon the prostate that its infection overshadowed in importance all other pathology accompanying chronic urethritis, a state of affairs that has persisted to the present day.

In acute prostatis the swelling and pain may be so marked that the diagnosis can be made by any tyro who takes the trouble to introduce his finger into the rectum. The mistake that the beginner is likely to make is in not recognizing a peri-prostatitis, a vesiculitis, or a peri-vesiculitis, assuming that the whole trouble is the inflamed prostate. But chronic infection of the prostate gland is not so readily diagnosed. Examination of the prostate by rectum gives an accurate idea of the size and consistency of the gland. Indeed, in thin subjects with the bladder empty, it is possible to study the size and shape of the prostate bimanually with one hand pressing suprapubically, much as we do the uterus. A negative rectal finding, however, is unreliable, since it is not uncommon to find a gland that feels normal to the finger whose expressed secretion is loaded with pus. The two-glass test, which largely because of its simplicity is generally used in the study of the urine in urethral infection, may be entirely fallacious. Not only the second glass but likewise the first glass urine may be macroscopically clear and yet the secretion from the prostate may show pus. Pus in the fluid expressed from the prostate is the only sure index of infection of the gland. We must acknowledge some difficulty in being certain that all the material presenting at the meatus after prostatic stripping is from the prostate even if thorough irrigation of the urethra precede the massage, since it is hardly possible in expressing prostatic fluid to avoid forcing secretion from the vesicles, the ampulla, the ejaculatory ducts, and from Cowper's glands. In practice this point is not of much importance since if these

*Read in Section on Urology, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

structures be affected we are justified in assuming that the prostate is likewise.

Hematogenous infection of the prostate, besides that due to tuberculosis and to lues, occurs more frequently than is generally taught. Usually, however, infection of the prostate is secondary to infection of the urethra. Statistics are variable, depending in some measure upon the mental bias, the industry, and the opportunity of the compiler. It is my opinion, founded upon my own experience, that the prostate is involved in 85 per cent of all cases of gonorrheal urethritis and in upwards of 50 per cent of all cases of non-specific infections of the urethra. For many years my co-workers and I have made routine slide examinations of prostatic secretions in cases of urethral infections. Many cases have been checked by cultural methods, and some few by the compliment-fixation test for gonorrhea. While it is the rule to find the specific organism of Neisser in acute gonorrheal infection of the prostate, it is our experience that it is rare to identify this organism in chronic prostatitis. The longer established the disease, the less the probability of finding gonococci. We have in our records but one single case with a reliable history of infection of more than two years' duration in which we were able to find an organism that appeared both on staining and culturally to be the gonococcus. This patient married with these cocci still present in his prostatic secretion. His wife has borne two children since, and she is not infected. In gonorrheal infection of glands it would appear that, with the passage of time, some change occurs either in the soil, or, as a result of the invasion of other organisms, in the secretions, that brings about the disappearance of the gonococcus. This occurs irrespective of the line of treatment employed. In my opinion, it is an error to assume that any Gram-negative diplococcus in prostatic secretion must be the gonococcus. Yet I believe that frequently reports of the presence of gonococci are dogmatically made on this evidence alone. Analysis of the last 400 reports taken from our laboratory records gives the following figures:

Pus present but no organism found	168
Diphtheroids	76
B. coli	43
Staphylococcus	39
Staphylococcus and diphtheroids	25
Staphylococcus and B. coli	19
B. coli and diphtheroids	2
Strepto-bacillus	1
Gonococcus	13

Slides were stained after the Gram method and it is hardly necessary to add that reports are founded upon the morphological appearance of the organism. In this series no streptococci are noted. Likewise no cases of pneumococcic infection were present. This latter organism may be confused with the gonococcus unless a differential stain is employed. Of the thirteen cases whose secretion contained Gram - negative intracellular diplococci, morphologically gonococci, none gave a dependable history of infection of more than six months' duration.

With the recognition of prostatitis as a complication of chronic urethritis, there have been introduced many methods of treatment directed toward the infected prostate. Blistering of the perineum has fallen into deserved neglect. The application of heat to the prostate through the rectum, one of the earliest methods of therapy, still is extensively employed. Hot rectal douching, preferably with a tube of the Kemp type, is a simple but more or less unsatisfactory method. The psychrophore permits of the more prolonged application of heat without disturbance of the bowels. The perfection of an electrically heated sound controlled by a thermostat has made possible an intensive trial of the value of heat as applied to the prostate. My experience with this instrument convinces me that, while heat may be of value in acute inflammations of the prostate, it is of little or no value as a curative agent in chronic infections of the gland. The use of injections into the prostatic urethra either by pressure or by means of the deep urethral syringe enjoys much popularity, being usually employed in conjunction with prostatic massage. I have injected solutions into small prostatic abscesses through a ureteral catheter introduced into the cavity through the cysto-urethroscope.

Sounds and dilators are much employed in the treatment of prostatic infection and the accompanying urethritis. At one time I faithfully tried the faradic and galvanic current applied through the prostatic electrode in the rectum to the region of the prostate. I am sure that any benefit that follows this line of treatment is psychic rather than physical. The use of vaccine, both stock and autogenous, have in my hands failed to secure the wonderful results claimed for them by some enthusiasts. Favorable reports upon the use of the x-ray in disease of the thyroid and more recently of the tonsils, and the good results claimed as a result of the use of this agent in prostatic conditions by Stern,[8] Wetterer[9] and others, have encouraged me to try radiotherapy in chronic prostatic infections. To date we have used x-ray treatment in seven cases. It is yet too early to discuss methods of application or results, but I may say that, so far, we do not feel encouraged.

In 1894 massage was adopted by the Royal Institute of Massage at Stockholm as a routine treatment in chronic infections of the prostate gland. Now, after more than twenty-five years, massage of the prostate is generally employed in the treatment of chronic prostatitis, superseding, or, at the very least, overshadowing all other therapeutic measures as directed toward this disease. Bold, indeed, is the iconoclast who dares to question the merits of a procedure so firmly established in the practice of every urologist and so generally accepted by the medical profession in general. Any doubt as to the curative value of massage in prostatic infection is found rather in the literature of the period shortly following its general introduction rather than in that of today. "By regular massage," wrote Casper[4] in 1906, "after several months the process may be much ameliorated and occasionally cured." Greene,[5] in 1907, said that prostatic massage should not be attempted in every case of chronic prostatitis, and that diminution of the size of the prostate as ascertained by rectal touch may not be attended by improvement in the general health of the patient. With less conservatism, Morton,[6] in 1913, claimed that only in a few cases is it impossible to rid the prostate of pus. Apparently not even this slight doubt clouds the minds of many present-day writers. Typical of the viewpoint as shown in recent literature is the statement of Fraser:[7]

> "When examining prostatic secretion with a view of determining cure, the presence of pus is more important than that of organisms. Leukocytes and pus cells must have disappeared from the prostatic secretion before any idea of a cure is entertained."

It is interesting to note that prostatic massage was at first an effort to improve the prostatic circulation by massaging around the gland with a circular rotary motion of the forefinger, but not massaging directly over the gland. The method at present popular would appear to be not so much the massage of the prostate as it is the forcible expression of the secretion of the gland by stripping with the finger introduced into the rectum. This procedure varies both in degree and in frequency with the ideas of the operator as well as with the courage and endurance of the patient. Some massage the gland gently, securing little or no prostatic secretion. Others rub so vigorously that blood in the secretion as it appears at the meatus is the rule and bleeding from the rectal mucosa not unknown. Some patients permit rubbing until the operator desists from fatigue, others complain bitterly during the entire procedure and not infrequently force the physician to stop before he has given what he considers adequate treatment.

I have been massaging prostates for many years. In 1904 I published an enthusiastic approval of this procedure. Today, after a vastly greater clinical experience and with a judgment tempered by more mature years, I confess myself unable to subscribe to the general opinion as to the great therapeutic merit of prostatic massage. I still rub prostates, probably as regularly as I ever did. I know of nothing better to do. But I am convinced that the value of massage of the prostate as a curative measure in chronic prostatitis is enormously exaggerated. I see every day cases of gonorrheal prostatitis in which the gonococcus disappears from the secretions after treatment by massage. But I have seen, not once but scores of times, patients with gonorrheal infection of the prostate discontinue treatment for one rea-

son or another, or for no reason at all, to return months or years later well of their gonorrhea, although they had had no treatment directed toward the prostate in the interval.

Regardless of the kind of treatment employed or the length of time treatment is persisted in, in my experience it is extremely rare to find a prostate once the seat of pus infection that eventually is entirely free of pus. I make this statement with some trepidation since I fear that it will be either scornfully ignored, as coming out of the mouth of ignorance, or will be assailed with instant and vigorous criticism. Many of these cases improve with time. If no new infection occurs, this improvement may progress so far as to show only a small amount of pus present where it had been abundant before. But I am of the opinion that careful and repeated examinations of the secretions from any prostate that has once been the seat of infection will show pus still present. If my opinion were founded only upon my own experience and that of my associates, I should be compelled to assume that some grave fault in our technic was responsible for our results. But, fortunately, we have had opportunity to examine a great many cases that have passed through the hands of others, cases treated not only in our immediate vicinity, but throughout the United States and even in foreign lands. Some of these patients have been told that they were cured, many have been regularly treated for months or years. When a reliable history of prostatic infection was obtained, invariably the microscope showed pus.

In 1909, Young[10] prophesied that in the future we would come more and more to a conservative operative treatment of chronic prostatic infection. This prophecy has not yet been realized. Incision and drainage of prostatic abscesses that fail to rupture into the urethra is routine. But this operation is not curative of infection in other portions of the prostate. In fact, nothing short of removal of the entire gland would serve to cure the infection. Witness the failure of tonsillectomy if a piece of the tonsil too small even to be recognized at the time of operation is left *in situ*. The growing popularity of vesiculectomy over vesiculotomy is due to the frequent failure to bring about cure by the simple incision and drainage of the infected vesicles. A true prostatectomy which would mean the removal of the entire prostate with the prostatic urethra and which is likely to be followed by impotence and by incontinence and, certainly, by sterility, is too formidable an operation to be considered for any condition short of cancer. Its serious discussion in connection with pus infection of the prostate gland is unthinkable.

The importance of pus in the prostate in relationship to marriage opens up a subject too large to be discussed within the limitations of this paper. I shall only say that, when I am convinced by repeated and careful examinations that gonococci and streptococci are absent from the prostatic secretion, I do not hesitate to permit marriage. I have yet to regret my decision in a single instance. To refuse permission to marry to every man whose prostatic secretion shows pus, regardless of the organism present, is to condemn the large majority of adult males to celibacy. *305 Baronne.*

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DISCUSSION

Dr. J. T. Jelks, Hot Springs, Ark.—Here in Hot Springs we see all kind of cases, but very seldom an acute gonorrhea. All the cases that come here have either been mistreated, undertreated, or overtreated. I do not say this with any discourtesy whatever to the members of this Section, for most of our cases come from the general practitioners who do not care to deal with such things.

It has been our experience that we have to be gentle in the massage of the prostate. Many cases have been abused and injured by too strenuous massage and each case must be treated according to his condition and nervous temperament. In treating these cases we find frequently

that there are strictures, and nearly all have trouble in the verumontanum. Many have vesiculitis and in many the vesicles are full, sometimes the entire prostate, sometimes one lobe or the other is congested and enlarged. In treating these conditions there is no special single method that will give results. We give prostatic massage, use sounds when indicated, urethroscopic treatment of silver nitrate to ulcerated area and to congested verumontanum, and the instillation of argyrol or mercurochrome, or some other accepted treatment.

Another point that was not dwelt upon is the importance of elimination and general treatment in these cases. Most of these patients are constipated. They do not drink much water and it is very essential that plenty of elimination should be carried on through the kidneys and intestinal tract. We seem to get results in Hot Springs not obtained in other places by reason of the fact that the patient is here under our care and will do what he is told. He will take the baths, be regular in his habits of eating and drinking, and he gets the benefit of the regular habits, free elimination and regular treatments.

I do not know whether we get much result or not with vaccines but we endeavor to give anything and everything that may be of benefit.

Dr. Nelken is inclined to be a little pessimistic in regard to these conditions. We see patients with conditions that apparently nothing but an operation will relieve, but by persistent treatment they improve.

I do not believe a little pus in the prostate, which is likely to be there for many years, should prohibit marriage.

Dr. Claude G. Hoffman, Louisville, Ky.—It has been said "once a prostatic, always a prostatic." This hits the nail on the head in many instances. We see patients who have been treated all over the United States, many of whom have become pronounced neurasthenics. Prostatitis has become an appalling condition, especially in large cities. Not all chronic cases of prostatitis are due to Neisserian infection. I have seen many cases caused by the colon bacillus.

The prostate gland is a portion of the anatomy that has been largely overlooked by the general practitioner. In searching for a focus of infection the ordinary doctor will examine the prostate last, after having extracted teeth and removed tonsils, etc. In my experience the prostate has been the focus of infection in many instances. In these cases all narrowings of the urethra and other pathology must be eliminated before completing the diagnosis. I recall one case in particular where the trouble was due to back-pressure of the urine because of a small meatus. The diagnosis was not made until after a meatotomy had been performed prior to cystoscopic examination. Three weeks later when the patient returned for cystoscopy his prostatitis had entirely subsided.

The general practitioner seldom thinks of investigating the hygiene and general condition of patients of this class, and whether or not he suffers from constipation, etc. Every general practitioner will treat prostatitis, and we have had patients say: "Dr. So-and-So massaged me for ten minutes, and I had to lie down for a while before I could leave the office." It is not the urologist, but the general practitioner, who treats these patients too strenuously and thus causes damage.

Dr. Hardie R. Hays, Jackson, Miss.—I want to sound a note of warning about the figures we give out. I am doing public health work and we base our conclusions a great deal upon what the urologists say. You must remember that only the cases that are being treated for the prostate gland come to you. It has been estimated that 85% of men up to the age of thirty-five have a gonococcus infection, and if 85% of that class of cases have a prostatitis or inflammation of the prostate gland you can see what a large percentage never get well. I do not believe you see that great a percentage of men who are carrying around with them a diseased prostate gland. If you take it down in our section of Mississippi where practically all the negroes are infected with gonorrhea, and then take 85% who have an infection of the prostate gland the numbers would be appalling. Those negroes go on to old age, and die of something else, and rarely come to us complaining of the prostate gland.

When we go before the public and discuss these figures they should be very carefully given.

Dr. J. L. Morgan, Memphis, Tenn.—Dr. Nelken leaves the impression that whether we treat these cases or not the gonococcus disappears in two years. I am sure that is not the case, at least in most instances. I also disagree with him in that prostatic massage does not do any particular good. If I believed that, I would not massage a prostate, for certainly there are many things more pleasant to do. In something over one thousand cases of gonorrhea that I have treated in the out-patient department of the genito-urinary clinics in Memphis and in my private practice, we have been able to demonstrate the gonococcus in over seven hundred cases. As far as any one way of telling whether or not a patient is free of gonorrhea is concerned, we have not yet found that way. After ten or twelve negative smears, I mean those in which we found only few pus cells and those in which we failed to find the intracellular diplococcus, we can tell those patients that we think they are well but we cannot tell absolutely. We should advise them to return in a month or two and not give them permission to marry at that particular time. But after so many negative prostatic smears, we are as near to a cure as we are going to get. There is no time that we can tell a patient who has had chronic gonorrhea or prostatitis that there is no danger in his marrying, for no matter how long it has been since the original infection he may infect his wife. We should always be guarded in our prognosis in these cases.

Dr. A. I. Folsom, Dallas, Tex.—We should differentiate very clearly just what we mean by a cure of a chronic infection of the prostate gland. Many of these cases are entirely relieved of their specific infection in much less than two years. A clear line should be drawn between the two types,

whether or not they are infectious, or whether the prostatic secretion is free from pus.

After a prostate has been infected it is not absolutely necessary to find that secretion entirely free of pus to feel that that prostate is innocuous. It is entirely possible to have a few pus cells and yet have no real trouble and not much potential trouble if the case is watched carefully.

The question of healing after rest is an experience we have all had. I think it is generally recognized that a period of rest is of great value. Many cases will clear up after a rest of a month or six weeks that have continued to show pus under other treatment.

I am distinctly against the heavy-handed massage of the prostate, but I think the delicate, light-handed fellow who simply tickles the gland is as wrong as the fellow who abuses it.

There is another point on which I wish to take issue and that is the use of heat in chronic prostatic infections. We have for some years been using heat applied by means of a box about two feet high with a lid over it with a hole in the lid, much like a toilet seat, and in that box are eight lamps, of which we can turn on as many as we wish. This will raise the temperature of the pelvis decidedly and the application of heat in that way will loosen up the secretions in the gland and you will be able to empty the prostate much better. I have had three years' experience with this and consider it of distinct value in the treatment of these cases.

Dr. H. W. E. Walther, New Orleans, La.—We have not been quite elemental enough in speaking of these cases. Some of them need massage once a week, some need it three days a week. Some need more vigorous massage than others. This has not been brought out today. The fact of treating the prostate, losing sight of the patient and later having him return cured is an experience of many of us. I constantly practice intermittent treatment of this kind, and not only do we get results by this method, but we hold the patient. I think rest in these cases is as important as the massage.

It is not necessary to get the prostatic secretion free of pus in order to have a cure in the common sense term of "cure."

The prostate can infect the vesicles and vice versa. In old, long-standing infections, if the vesicles are neglected in massaging the prostate, whether palpable or not, in many instances we will not get the proper results.

I cannot agree with the Doctor who said the gonococcus lived for two or three years in the prostate.

No man can lay any particular value on the microscopic findings unless he does his own microscopic work. I will not take the figures of any laboratory, especially laboratories where young medical students or, worst of all, technicians, are doing the microscopic work. We have repeatedly had patients sent to us with reports from some laboratories which always find gonococci in patients sent to them by urologists. Evidently they consider this just as necessary as to find a positive Wassermann reaction in cases suspected of having syphilis.

Dr. Miles A. Copeland, Birmingham, Ala.—I have a string of twelve or fifteen patients coming to my office for an occasional massage of the prostate. I often tell them that, after an experience of this kind, the prostate becomes defective in that it does not drain itself. Each case requires different treatment, some more vigorous and more frequent than others. But with this occasional massage the prostate stays in as nearly a normal condition as possible. I am very fond of heat in my treatment.

Dr. H. King Wade, Hot Springs, Ark.—In the infection of the prostate there is usually a coexisting seminal vesiculitis and you might massage until Doom's Day without getting results if this is the case. For this condition many things have been advocated, among them vasotomy. I have treated many cases by massage for weeks which had been massaged by other physicians without getting results, but I have been able to get marked results by vasotomy. I am convinced that if you overlook the seminal vesicles you will not get as good results in cases of prostatitis.

Dr. I. G. Duncan, Memphis, Tenn.—The gonococcus will live as long as a man does. A man came into my office the other day who said he had had no trouble since he married twenty-five years ago. During that time he had stuck to the straight and narrow path, but his first wife had died and he wanted to get married again. He was impotent and thought he might not be able to carry out his marital obligations. I massaged the prostatic gland and found many gonococci.

Vaccine in complicated conditions does good, but it has to be given in large doses until you get a pretty good reaction. In chronic cases where you find seminal vesicle infections and often an associated infection in the kidney, the organisms come down and reinfect the posterior urethra and prostate gland continuously, and that is why we do not get rid of gonorrhea.

Dr. Henry McClure Young, St. Louis, Mo.—I have become very skeptical as to the role played by the gonococcus in chronic prostatitis. One thing we know about a gonorrhea and that is that many cases get entirely well. Others still have pus cells in the prostate after the gonococcus has disappeared. But they may have had them before they ever contracted gonorrhea. We cannot prove that they did not. In any event they get rid of their gonorrhea. The gonococcus is not believed to live more than two or three years in the host. Whenever they are reported as present after the lapse of a greater period of time a question must always arise as to the true nature of the organism found. The only absolute proof would be the inoculation of a virgin soil. The mere finding of an occasional Gram-negative diplococcus does not prove gonorrhea. As for the case where you do find absolutely typical gonococci in groups and intracellular in the prostate of a patient who says he has had no intercourse for twenty-five years, he presents you with the following very simple alternative: which is it

easier for you to believe, that this wonderful thing has really happened or that a man has lied?

In the treatment of these cases the bacteriology is important. If you find many bacteria, especially the colon bacillus, the patient does not stand instrumentation so well as those who simply have pus. But that is not the universal rule. I found one case where we had repeated negative cultures, but still I could not put a sound in without the patient's having a turbid urine for several days afterward. A very careful urethroscopic examination is a routine. We often find blebs and polyps which can be burned out. We find little pockets running down that may be sterilized, using 10 per cent nitrate of silver, and I have also cauterized these little sinuses with the high frequency current. I have seen marked benefit from this treatment.

I would also like to say a word for a drug that has received much commendation, and that is mercurochrome. I use 3 to 5 c. c. of a 1 per cent solution of mercurochrome instilled once a week after massage. On his next visit the patient, if he will tolerate instrumentation, is dilated and irrigated with a cyanid of mercury solution, about 1 to 25,000. On the next visit he is massaged again and I frequently find mercurochrome in the secretion, although none has been used for a week. It penetrates into the tissues further than any other drug I know. For that reason it must be used cautiously. It cannot be used every day, for it sets up irritation. I at first used it too often and was disappointed, but since using it more sparingly I have been much encouraged in the results. Some very prolonged and rebellious cases have recovered under its use.

Dr. Thomas N. Black, Hot Springs, Ark.—As Dr. Jelks has told you, about 75 per cent of the practice of a urologist here is in dealing with the chronic prostate. The various discussions for and against massage, and the many variations in treatment, all go to prove that none of us is satisfied as to the proper course to pursue. I have tried every known method only too often to meet with defeat. Each year I have visited the various large clinics hopeful of finding some new and more successful method of handling these cases, but there, as here, it is still a problem.

Since the first of this year I have tried to depart from the old routine of massages, irrigations, instillations, etc., for a more radical form of treatment and am delighted with the results thus far obtained. In every instance where I can persuade the patient to do so, I have placed him in the hospital for a period of two weeks' rest; and this means absolute rest. Very few will listen to my plea for a trip to the hospital, preferring to roam the streets between treatments. In the hospital he is subjected to the following treatment: twice daily instillations of argyrol or mercurochrome into the prostatic urethra; three times daily application of heat to the prostate by means of the Chetwood tube; and daily intramuscular injection of some foreign protein to raise the body temperature. This last is done only the first three or four days and I attempt to get the temperature up to 103°. I do not believe the gonococcal vaccines are better than any protein which will raise the temperature, and in my practice I often use typhoid suspensions.

The most important point is the proper care of the seminal vesicles. Too frequently they are overlooked. My experience teaches me that 90 per cent of all cases of chronic prostatitis are complicated by a seminal vesiculitis. Consequently I open the vasa in every case and inject the vesicles with 25 per cent argyrol or 2 per cent mercurochrome. In the vas openings I place a short piece of a No. 4 ureteral catheter and tie it in place. Then each day for four or five days I reinject the vesicles through these catheters. This can be done with small silver wire tubing very satisfactorily. Repeated injections in this way are necessary and never give the patient any discomfort. It is well to explain to him the possibility of sterility resulting. The majority prefer sterility to infection.

The results obtained from this method have been most gratifying. In something like fifteen cases treated this way only one has failed to show complete recovery both clinically and microscopically, and that case, I discovered later, had as a complication a colon bacillus pyelitis.

Dr. Victor D. Lespinasse, Chicago, Ill.—At the Congress in Washington last December a resolution was passed to the effect that if the prostatic fluid contained more than six leukocytes it was not cured and was dangerous. I have forgotten who the committee was that promulgated that idea, but it was accepted.

In vasotomy the use of the permanent catheter or silver tube or anything in the vas is a very dangerous procedure. It works well immediately and you can inject the vesicle through it very nicely, but when you dissect out the vas in six months or so you find it is plugged. It is striking how many times this occurs and how little irritation it requires to block a vas. I had an experience with this in doing a vaso-epididymostomy, using a needle with which to puncture the vas and inject our salt solution. When I reoperated upon the man later I found that the vaso-epididymostomy operation was patent, but that there was a closure of the vas at the site of my puncture. So I am sure that if vasotomy is done with retained instruments it will mean a large increase in closure of the lumen of the vas which will come to light later when these patients marry and wonder why they have no children.

Heat has been one of my hobbies and I have used it in all sorts of ways. I have used the sound and the rectal heater and also a little method that the Doctor did not mention, heat generated in the tissues themselves, the so-called diathermy. It is a little difficult to control and there is some danger of heating the tissues too hot because there is no check except the sensation of the patient, which is not reliable in deep tissues. In bone and joint work there are instances reported where the bone has been burned and the skin not harmed. I have been fearful of doing that in the prostate and also in the penis. You

can see that a burn there would be rather annoying to explain to the patient.

Dr. Nelken (closing).—If my paper and the remarks that have greeted it represent the consensus of opinion among urologists, why is it that a reading of the literature on the subject of prostatic infections gives an impression so at variance with this viewpoint?

SOME OBSERVATIONS ON THE TREATMENT OF GONOCOCCAL ARTHRITIS IN THE MALE*

By Neil Moore, M.D., F.A.C.S.,
St. Louis, Mo.

The literature on the subject of gonococcal arthritis is quite voluminous and the various kinds of treatment are almost equally numerous. Virtually every one comes to the same ultimate conclusion, that it is a very difficult condition to treat, and always treacherous in its maneuvers because of its fleeting characteristics. It may be in one joint and entirely change location within 24 to 48 hours. Even orthopedic surgeons with their many appliances dislike cases of gonococcal arthritis, and will usually welcome a case of tuberculous arthritis instead. Nothing is more disappointing than to apply nicely and comfortably fitting plaster cast, and the next day find another joint involved, and the one previously immobilized virtually free from symptoms.

In reality the condition is nothing more nor less than a sign of trouble elsewhere in the body similar to most arthritis, that is, a focus of infection, which metastasizes to other parts of the body, usually the large joints, owing to their peculiar anatomical construction. The result is inflammation with all its symptoms and signs, such as swelling and redness, serous and occasionally purulent exudate, marked pain, almost complete loss of motion, and fever from 100 to 105° F. Usually there is an increased leucocyte count, and in all of my cases where the test has been made, the gonorrheal complement fixation test has been positive.

Foci of infection are in nearly every case located in the genitals, and in the male the greater number of these are located in the prostate and vesicles. One case, however, has been reported of an arthritis following ophthalmia neonatorum. Metastases from these foci usually occur in the second or third week of the infection.

Treatment from which I have had most gratifying results consists of:

(1) Elimination of the focus of infection.

(2) Increasing the patient's resistance by injecting some foreign protein.

(3) Attention to the affected joint as to comfort of the patient, to prevent further complications such as ankylosis and pus formation, and to relieve the inflammation.

Though some writers apparently disregard elimination of the focus of infection, in my experience it is by far the most important part of the treatment.

Daily prostate and vesicle massage is started, followed with a bladder and deep urethral irrigation of some good antiseptic solution, preferably 1 per cent silvol or argyrol. Usually the first few massages do not express any pus or bacteria, and it is here that the untrained physician is likely to pronounce the prostate and vesicles not at fault. Perseverance will result in the expression of demonstrable pus and probably microorganisms, usually in large quantities. These massages and irrigations are continued at regular intervals, not only until the arthritic symptoms and signs have disappeared, but until there are no signs of infection in the prostate or vesicles.

Heat applied to the prostatic region by means of a rectal siphon, as warm as the patient can endure, 20 to 30 minutes once or twice daily has been of material aid in overcoming the infection. When this cannot be accomplished hot sitz baths have been beneficial.

Urethral strictures or ulcers which may harbor the gonococcus, and periurethral abscesses are sought for, and eliminated when found.

Vaccines and serums have unquestionable merits, when wisely and carefully used. This has been clinically demonstrated in cases treated. Cases 4 and 5 of the series here reported especially show this. Haworth reports excellent results

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*Read in the Section on Urology, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., November 14-17, 1921.

in 16 cases from the use of sensitized vaccines alone. Malleterre had good results from the use of antimeningococcic serum and recommends it particularly in the polyarthritic types. Culver reports satisfactory results following the injection of proteose solutions, including dead gonococci. He refers to instances of an increase in the opsonic index, resembling that produced by injections of killed gonococci, following massage of the prostate, or the affected joint. He has observed the greatest clinical improvement following the first injection, but ultimately he says:

"It would seem that there is no particular factor which is responsible for the benefit derived in favorable patients, but a series of events occur, which when acting together, or in succession, tend toward the relief and ultimate recovery of the individual from infection."

On account of the difficulty of obtaining satisfactory autogenous vaccines the plain stock gonorrheal vaccines containing 1000 million to each cubic centimeter have been used in this series of cases. The results have been so satisfactory that no other protein solutions have been used.

The method of administration has been to begin with injections of 8 minims, after the extreme fever has subsided, give daily, increase 1 minim each day until there is a local or general reaction and then decrease to 1 c. c. every second or third day until there is marked improvement in the focus of infection and the involved joint. This usually requires from two to three weeks, and in some very resistant cases, much longer. In my hands the intravenous injections have shown no advantage over the subcutaneous, and hence, the latter is the one most used.

In the direct treatment of the diseased joint all splints and casts have been dispensed with. Immobilization is accomplished only for the comfort of the patient, in two ways. If the involved joint is of the upper extremity, the forearm and hand are put into a sling suspended from the neck, and the patient allowed to walk about. If a joint of the lower extremity is involved the patient is put to bed and pillows placed about the joint to give comfort. With this small degree of immobilization and the absence of mechanical splints, two very valuable applications and manipulations are easily administered.

(1) Heat applied to the affected joint from onset until swelling and stiffness have disappeared is very beneficial. It may be used in either dry or moist forms, but in my hands the former has been the more useful. It is applied as an electric pack for from 30 minutes to one hour, or until the joint and surrounding tissues have become extremely hyperemic.

(2) After the fever has subsided active and passive motion are started, beginning gradually and increasing, using as a guide the general symptoms and local signs. It is best administered at the time the joint is in the hot pack.

Passive congestion given by applying a tourniquet proximal to the affected joint for a short time, which was suggested to me by Dr. W. T. Coughlin, is, doubtless, beneficial; but unfortunately it can only be applied to joints of the extremities.

It has not been necessary to aspirate a joint in the cases treated.

Time and space will not permit a larger review of cases than those reported. They do not represent all that have been treated by the methods described, but are selected because of the variety of joints involved.

Case I.—F. G., a second lieutenant, was referred from the Surgical Service to the G. U. Service, Base Hospital, Camp McClellan, Ala., January, 1919.

About three weeks after the onset of an acute gonococcal urethritis the left shoulder became swollen and tender. Three days later the left elbow became involved, and the shoulder involvement soon subsided. The whole left arm was then placed in a plaster cast, in semi-flexion and allowed to remain for 10 days, at the end of which time there was no improvement. He was then referred to me.

After removal of the cast, examination disclosed a swollen, partially ankylosed left elbow joint, which was very painful and tender. There was no fever, no urethral discharge, and no frequent or painful urination. The two glass urine test showed a few shreds in the first glass. The second was clear. There were no urethral strictures. The gonorrheal complement fixation test was positive. Massage of the prostate and vesicles revealed a few pus cells, but no demonstrable bacteria. The prostate was not swollen or extremely tender. After the third or fourth massage, pus and gonococci were numerous.

After three weeks of the above outlined treatment, the patient was virtually free of symptoms. The condition of the prostate and vesicles had materially improved and he had regained almost complete use of his left elbow. Four months later he consulted me in private practice, suffering from no inconvenience except a slight

morning urethral discharge, which yielded very nicely to prostate and vesicle massages, followed by bladder irrigations. His joint condition was apparently normal.

Case II.—S. N., a grocer, referred by Dr. W. T. Coughlin, in March, 1920. He had had gonorrhea in January, 1920. He was treated by his family physician in his home city and pronounced cured at the end of six weeks, as all discharge had disappeared and the urine was clear. About two weeks later the left knee became swollen and tender, and he was referred for surgical treatment.

Examination disclosed no urethral discharge. The first glass urine showed a few shreds, and was negative for gonococci. The second was clear, and there were no urethral strictures. Rectal palpation revealed a moderately enlarged prostate, tender, smooth in outline, and of firm consistency. The vesicles were not palpable. The prostatic and vesicle expression consisted of 5 or 6 drops of muco-purulent material containing a few pus cells, and no demonstrable bacteria. After a few massages the pus was more abundant and gonococci were demonstrated.

The left knee joint was considerably swollen, tender and stiff. The gonorrheal complement fixation test was positive; the Wassermann, negative. There was no high fever.

After about 3½ weeks of continuous treatment he left the hospital, walking with a cane. Further observations at weekly intervals were discontinued early in July, 1920, and the patient was discharged as cured.

In October, 1921, the patient applied for treatment of another condition. Examination disclosed no signs of urethral or prostatic trouble. The knee joint appeared absolutely normal. He states there has not been any pain since the swelling disappeared.

Case III.—W. C. S., a railroad man, referred by Dr. L. A. Will, in August, 1920. He had a history of recurrent gonorrhea for the previous two years. Three weeks before applying for treatment his right wrist became swollen, red and tender. There was an indefinite history of syphilis, which had been treated.

Examination: The Wassermann was negative, and the gonorrheal complement fixation test positive. There was a marked involvement of the right wrist. The urethral discharge showed gonococci. There were no urethral strictures. The two glass urine test showed both cloudy, containing pus and gonococci. The prostate and vesicles were very much involved and the expression contained numerous pus cells and gonococci. There was no fever.

Owing to the patient's occupation, he could take treatments only two or three times a week. He at once began feeling better generally, and the improvement in the prostate, vesicles and urethra was entirely satisfactory; but at the end of a month the joint condition showed no improvement. Close questioning elicited the information that he was using his right hand to strike a ticket stamping machine. Caution against this was followed by immediate and continuous improvement to definite relief.

In February, 1921, this patient was married, though he was advised not to do so, because of the slight possibility of recurrence. Soon after this he was called away from St. Louis, and all treatments were discontinued. On July 3, 1921, he reported in good condition except for an occasional slight urethral discharge. Examination of this showed considerable mucus, a few pus cells and no bacteria. The urines were clear and the prostate and vesicles apparently normal. The joint condition was absolutely normal.

Case IV.—R. H., a physician, developed gonorrhea early in August, 1920. He treated himself with anterior urethral injections. Two weeks after the disease started he injected subcutaneously 1 c. c. of a mixed gonorrheal vaccine. This was followed by a severe chill and fever, and 48 hours after the injection his right knee became involved.

Examination: The right knee was swollen to three times normal size, tender and stiff. The gonorrheal complement fixation test was positive, the Wassermann, negative. There was no urethral discharge. The first glass urine contained a few shreds in which no bacteria could be found. The second was clear. The prostate was swollen, regular in outline, not tender, and no pus could be expressed. Daily prostatic massages continued to show no pus, until at the end of a week large quantities of yellowish pus could be expressed, which contained gonococci. Fever ranged from 100 to 105° F. for about a week, when it gradually subsided.

After four weeks treatment in a hospital the patient left, walking with crutches. Further improvement was rapid, and at the end of 10 weeks, the joint condition was normal, which condition obtains to the present time.

Case V.—A. B., a bookkeeper, referred by Dr. J. C. Lyter, in May, 1921. He had had gonorrhea in March, 1921, which was treated by a physician and supposedly cured. The latter part of April, all urethral discharge ceased and the urines became clear. Two or three weeks later the right ankle became involved.

Examination: The gonorrheal complement fixation test was positive, the Wassermann negative. His temperature was 99 to 101° F. The right ankle was considerably swollen and tender. There was a marked urethral discharge containing much pus and many gonococci. The two glass urine test showed both cloudy with pus and gonococci. The prostate was swollen, soft and tender. The vesicles were palpable and tender. The expression from massage showed gonococci.

After two and a half weeks of treatment in a hospital, during which time the vaccine was omitted for a period of 5 days and there was a recurrence of symptoms, the patient left, using crutches. He was advised to continue treatment. The prostatic condition was much improved and the urines were clear. Swelling had about disappeared from the joint.

Ten days after leaving the hospital the patient reported a recurrence of urethral discharge. He had received no treatment. The joint condition continued to improve. The urethral discharge contained pus cells and gonococci.

Office treatments at two and three day intervals were instituted. At the end of a month his condition was apparently normal.

At present there are a few pus cells in the prostatic massage, but no bacteria. The urines are clear. The joint condition is normal, except for a slight stiffness after a long walk, such as a hunting trip.

Case VI.—C. G., a railroad brakeman, referred by Dr. W. H. Gambill, of Centralia, Ill., in July, 1921. He had had gonorrhea in the late summer of 1920. He thought it was cured in January, 1921. The following month he developed a multiple arthritis. This was relieved temporarily by intravenous injections of sodium iodid solution, only to recur after a short time. A blood Wassermann was then found positive, and intensive syphilitic treatment was instituted without relief. Latterly the patient had lost weight and had been unable to work because of the pain he suffered.

Examination: There was involvement of both sterno-clavicular joints, one wrist and many small joints of the hands, one ankle, and definite tenderness of the small joints of one foot. His temperature was 100° F. There was no urethral discharge; the urine was almost clear. There was a moderate sized urethral stricture at the peno-scrotal juncture. The prostate and vesicles were markedly involved and the expression contained much pus, but no demonstrable gonococci. The treatment outlined above was carried out by Dr. Gambill, who reported on September 1 that the patient had had satisfactory relief and had returned to work.

On October 15 Dr. Gambill reported that the patient's condition was good.

CONCLUSIONS

(1) Gonococcal arthritis is the result of focal infection and should be treated as such. Hard work on the part of the physician with proper cooperation of the patient over a sufficient length of time is necessary for complete relief.

(2) Foci of infection in the male are usually located in the prostate and seminal vesicles.

(3) In the female, if the focus of infection cannot be demonstrated in the more superficial adnexa, a complete salpingo-hysterectomy should be considered.

(4) Injections of foreign proteins undoubtedly are of definite value in the treatment of these infections.

(5) Local treatment of the involved joint is of secondary importance.

Frisco Building.

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DISCUSSION

Dr. E. A. Purdum, Hot Springs, Ark.—There is no form of infectious arthritis more difficult to deal with than that of gonorrheal origin. We tell the patients they must expect it to be six months before recovery regardless of the ease with which any focus is eliminated.

I wish to stress the point that you must remove the focus of infection. Usually it is in the prostate, vesicles or glands along the urethra, and you can tell as a rule when the patient is in fairly good condition by the microscopic examination, the two-glass test, and so forth, but the focus may still exist when you fail to demonstrate the organisms for a short time, so we should re-examine from time to time even when the focus has apparently been eliminated if the case does not respond to treatment.

In the treatment it is most important not to immobilize the joint. In cases where we have taken the cast off after ten days we have had much difficulty in restoring full motion to the joint. You can obtain relief by fastening pillows around the joint, or by using other forms of immobilizing the joint, such as a crinolin bandage, which does not fix the joint so firmly. This is only necessary for a short time. When the pain is very intense it is not necessary to immobilize except as described above.

Nearly all cases of gonorrheal arthritis coming under our observation have been given morphia or some form of opium hypodermatically rather freely. With proper attention to the joint and vigorous use of the salicylates or similar compounds it is not necessary to use morphia and the patient never improves while the administration of narcotics is continued. In cases where the stomach has become intolerant to the salicylic compounds the drug can be used intravenously to advantage, and sodium iodid may also be administered intravenously with considerable benefit in some cases.

The application of heat probably gives most relief and gives to the joint the increased blood supply, which is important. You can use the hydrotherapeutic things if you have the necessary apparatus, and also diathermy, where the joint is thoroughly heated for fifteen to twenty minutes each day. It may be of value also to use injections of argyrol in the vas where the infection is not eliminated by massage. We have been unable to prove that it is of any great advantage, but it is undoubtedly of some advantage and time will prove whether it is of as much value as we think. The use of the foreign protein is of assistance, but in some instances it is carried too far. The injections are given over too long a time and the patient's reaction to the injection is too severe. When you begin with a small dose and get a reaction in excess of what you expect, you should stop it for a while, and then start with a smaller dose and increase it very slowly. After a few weeks of this treatment it is best to let your patient rest for a time, resume with a smaller dosage, and work up gradually.

Dr. H. H. Kramolowsky, St. Louis, Mo.—I wish to emphasize the importance of repeated examination of the prostate gland and vesicles before ruling them out as a source of infection.

Probably all of you remember instances when on first or second examinations you found the prostate and vesicle secretions microscopically negative, but on repeated massage you found pus. It is very important to make repeated examinations before stating that the prostate or vesicles are not the source of the infection.

Dr. E. G. Ballenger, Atlanta, Ga.—For the last seven years we have been treating these patients with synovial fluid by reinjecting it into the gluteal region. We inject from 25 to 50 c. c. of this fluid, which we draw out from the knee, repeating the injections about twice a week as long as there is any fluid left. So far we have treated twenty-eight patients by this method and in all of them we have found it unnecessary to employ any other means for the cure of the rheumatism. As a rule, acute conditions respond unusually well, clearing up simultaneously with the cure of the arthritis. Further treatment is usually necessary to clear up the urethra, prostate and seminal vesicles. The injections of synovial fluid are borne very well, causing about as much reaction as a medium size dose of vaccine. There is usually a rise in temperature and in a few instances there has been a slight chill.

The thing that impresses one most in employing this form of therapy is the very prompt response. There is a definite decrease in pain within twenty-four hours and in no instance has a patient been confined to bed for as long as a week after starting this treatment. The longest period during which we have treated a patient before the fluid gave out was three weeks. Unfortunately, all patients do not have fluid, and unless there is a synovitis and a fluid which contains pus cells we cannot use "his drug store and factory" to get his medicine for him.

We feel so confident when we see a patient with this form of arthritis that we do not hesitate at all in telling him that he will be relieved promptly, and so far we have not been disappointed in any acute condition. The chronic conditions do not respond so well and unless there is much pus in the fluid you need not expect a definite improvement in the condition. Unless the pus and organisms are present in the fluid you will not have the satisfactory results that you will have if they are there. Nature seems to manufacture at this point antigens and antitoxic substances which, when put into the general circulation, have a very beneficial effect. I am not trying to go into the details of the further discussion of the method. We do not do anything to the fluid. We draw it off, turn the patient on his side, see that the needle is not in a blood vessel, and inject it. We may put it in two or three different places if we use as much as 50 c. c. There is not so much reaction, as a rule, from this treatment as from the ordinary vaccine therapy, and many times there is none at all.

Dr. I. G. Duncan, Memphis, Tenn.—A young man came to me several years ago with an infection of the shoulder, elbows, wrists, fingers, hips and between the lumbar and sacral vertebrae, the knees and ankles and all down to his toes. He was drawn up as the tailor is when he sits to sew. He had been in the orthopedic service and had injections into the vein of typhoid serum, which nearly killed him. I went over him carefully and found a prostatitis and a badly inflamed seminal vesicle about the size of a hen's egg. An x-ray picture showed arthritis and the roentgenologist said that within six months every joint would be stiff and he would be like a stone man.

We began to massage his prostate gland, put him on vaccine and gave him an anesthetic and straightened out his limbs, and then put a brace on him. After a reasonable length of time we took the brace off and gave massage. He improved as long as he was treated, but when we stopped treatment he went back. As a last resort we removed his seminal vesicle. He improved greatly after that and I lost track of him, but a few days ago he came to the office. He still has a partial ankylosis between the lumbar vertebrae, the sacrum and hips. The fingers and toes have cleared up and he is able to get around and make his living. He feels so well that he does not wish anything more done to him.

Dr. J. Hugh Carter, Memphis, Tenn.—Dr. Curtis, of Chicago, and others have proved that gonorrhea in the female, so far as the tubes and ovaries are concerned, cannot be found after ten days; that the focus, so far as the female is concerned, is in the cervix and that only occasionally is it found in the endometrium. It has been proven that you have a paraplasia there and the gonococci are sometimes found, but with a thorough curettement and amputation of the cervix we can remove the infection without doing the radical operation on the female. It has been unnecessary in my service to remove the ovaries and tubes except in very rare cases. I have studied this phase of the subject for a number of years and have yet to find any case where the gonococcus has produced pus tubes *per se*. Of course where we have repeated attacks, or the occurrence of an exacerbation with a secondary infection, whether it be due to the streptococcus or some other infection; we are liable to have pus tubes, but it is very rare to find pus tubes following a simple gonococcal infection.

Dr. Moore (closing).—My results with injection of the vas have not been entirely satisfactory. I may have had good results in a few cases in eliminating the focus. One of the most important things I want to call attention to in this paper is the necessity of paying close attention to the prostate and vesicles, and of repeated massage, not once a week or once a month. Severe cases, unless they develop an irritation of the rectum, will stand firm daily massage very nicely. It is always wise to have the patient wear a scrotal suspensory to prevent, as much as possible, the development of an epididymitis.

Vaccines, I believe, are very beneficial, and should not be discontinued too early.

Injection of synovial fluid, which Dr. Ballenger mentioned, is simply the injection of a foreign protein comparable to what a number of physicians did a few years ago in withdrawing fluid from the pleural cavity in cases of pleurisy with effusion and injecting subcutaneously. They obtained very good results, but did not always eliminate the focus of infection.

The method has its weak points, too, in that it requires a good sized joint to withdraw the fluid from. It has been said that most of the ankylosis of these joints follows aspiration of the fluid. That form of treatment seems very good where indicated, but unfortunately, as Dr. Ballenger says, it cannot be applied to all cases. The treatment I have outlined is applicable to all forms of arthritis of this nature.

AMPUTATION OF THE LEG

By Thomas H. Hancock, M.D.,
Atlanta, Ga.

Any surgeon can cut off a leg, but it takes a good one to save some of them. Discussing this subject from a railroad viewpoint, let us imagine that a leg has been injured and we have to decide whether to amputate or not.

Some of the compound dislocations at the ankle may not require amputation, and useful limbs, sometimes almost perfect, may result. Some of the crushed ankles or feet may be made into useful members. It is not always well to decide at once, but be sure not to sacrifice a life attempting to save a limb. It is safe to wait a day or two when wet dressings have been applied. Those made of saline or boric solutions are good. The gauze should be covered entirely by gutta percha tissue and care should be taken that no part protrudes, or it will dry out.

I have purposely omitted reference to the Carrel-Dakin solution, as those mentioned will suffice, and any surgeon is competent to apply them.

A life often depends upon the prompt arrest of hemorrhage when a limb has been crushed, and it is remarkable how ignorant the average man is about the proper methods of stopping the flow of blood. It is a common occurrence to see a patient with a piece of bell cord tied once around a limb so loosely that you can run your fingers under it. It not only does not control the arterial hemorrhage, but hastens the venous flow.

Every railway employe should be instructed in regard to simple procedures which will stop bleeding. A piece of bell cord is usually at hand, but a twine string or suspender may be used, if applied properly. The cord should be long enough to go around the limb twice. It should be placed as near the wound as possible without danger of its slipping off and a surgeon's knot should be tied. If the two turns are put around tightly and the knot is tied properly, there will be no bleeding. This is very simple to us, but I have seen several men bleed to death from the ignorance of their fellow workmen, who did not know how to apply such a simple tourniquet.

There are many names for the various operations through the foot, but they have been discarded long since, as one would cut through bones or joints to get such a flap as he desired. Since the development of prosthetic appliances we have discarded amputations through the arch of the foot and the lower third of the leg, and have substituted amputations through the middle of the middle third, not the lower part of the upper third as suggested in many books. Sometimes, however, we have to amputate wherever we can get a suitable flap.

The ordinary methods of cleansing a limb are usually satisfactory, that is, using soap and water, followed by alcohol or tincture of iodin. But when the latter is used, do not follow with a bichlorid solution or alcohol which has been denatured with bichlorid, as biniodid of mercury will result, and it is one of the strongest blisters known. When the limb has been subjected to grease, ether, benzine or gasoline will be serviceable in cleansing it.

Chloroform is the king of anesthetics, but it is also the most dangerous if not properly given. More than thirty years ago the Hyderabad Commission, appointed by the British Government to investigate anesthetics, made a report that chloroform, to be safe, should not be given stronger than in 3.5 per cent concentration. Hence the mask should never be placed upon the patient's face, but should be held some distance from it, as it is not the quantity so much as the density of the chloroform that kills. When the patient has lost consciousness, ether should be substituted on another mask, which should be placed directly on the face. It is seldom necessary to concentrate the

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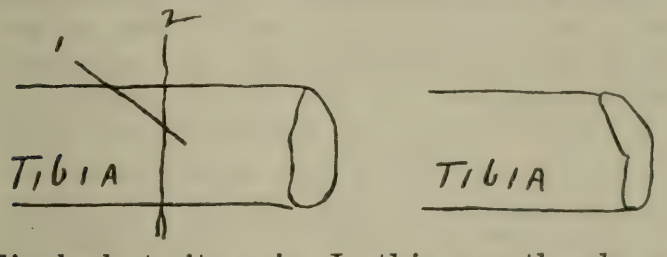
*Read before the Southern States Association of Railway Surgeons, Auxiliary of the Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

ether by placing a towel around the mask. An injection of morphin and atropin, a short while before the anesthetic is given, will aid in its administration and will retard shock. Some may advocate gas-oxygen to start with, but there have probably been more recent deaths from it than from all of the other anesthetics combined.

The preferable operation has the short circular anterior and the long circular posterior flaps which extend to the bone. This places the line of suture in front and away from pressure when wearing the artificial leg. The lateral flaps should never be used when it is possible to get these. The flaps should be snug, neither too short nor too long, but it is safer to err in favor of the latter.

The periosteum should be scraped back at the point of entrance of the saw, which should be used obliquely for some distance, then removed and the bone sawed perpen-



dicularly to its axis. In this way the sharp point at the crest of the tibia has been removed.

The periosteum should never be sutured over the ends of the bones, as it does no good and invites trouble should infection occur.

The muscles should not be quilted, as they contract from the irritation caused by touching the ends of the bones and cause much pain. Nature will take care of them and their greater part will be changed into fibrous tissue.

I have had no experience in the removal of bone marrow and periosteum from the ends of bones to prevent a painful stump.

Rubber tubing drainage is safer than complete closures, as it allows such blood as may ooze from the muscles to escape, and it is practically impossible to ligate so that some oozing will not occur.

The blood vessels should be ligated with plain catgut and the nerves should be pulled down and incised high up. The skin should be sutured with interrupted silk worm gut. If the needle is inserted so that the point comes out at the junction of the dermis and epidermis in the first flap and is introduced in the same location in the other, there will be perfect approximation and there will be no necessity of pushing in tissue when each suture is made. The silk worm gut needs no preparation except boiling with the instruments.

No splint is necessary after the amputation, but the limb should rest on a pillow which has been protected by a rubber case.

DISCUSSION

Dr. J. M. Burke, Petersburg, Va.—This is the first time within either my theoretical or practical experience that I have ever heard or thought of an oblique amputation. We ought to call it the "Hancock operation." Going through the middle third of a lower limb you have that magnificent cushion of the gastrocnemius muscle to help you and you have not the pain and suffering because the suture is up here in front.

EYE, EAR, NOSE AND THROAT

ABSCESS OF THE LUNG: ETIOLOGY*

By H. W. Lyman, M.D.,
Associate in Clinical Otology, Washington University Medical Department,
St. Louis, Mo.

Diagnosed cases of pulmonary abscess have increased very greatly in the last few years. The fact that the bronchoscopic treatment of this condition is assuming added importance, and that quite a number of these cases have occurred following operations upon the nose and throat make the study of this condition of prime importance to us as oto-laryngologists.

The terms, "abscess of the lung," "gangrene of the lung," and "bronchiectasis," are rather loosely used to describe various conditions resulting in destruction of lung tissue. This fact, which is not of great practical importance, is probably due to the anatomical peculiarity of lung tissue and to the clinical difficulty in exactly differentiating border line cases. For the purpose of this paper, the term "abscess of the lung" will be limited to circumscribed suppuration of lung tissue.

Dr. Charles W. Richardson, of Washington, D. C., first called attention to this condition as a complication of operations in the upper air passages by reporting in 1910 a case of septic infarct of the lung following tonsillectomy, and in 1912, three cases of abscess of the lung following the same operation. Since then there have been many such cases reported by Bassim, Manges, Tewksbury, Frank and others, following sinus operations, septum resections, extraction of teeth, and especially tonsillectomies. One of the latest reviews of this subject is that of Drs. Fisher and Cohen, of Philadelphia, presented at the meeting of the American Medical Association, at Boston, in June, 1921, showing reports of seventy-six cases of abscess of the lung following tonsillectomy.

Lung abscesses are practically never primary, but are secondary to infections of such severity that the lung tissue involved is unable to withstand the invading organism, and undergoes the succeeding inflammatory changes of hyperemia, extravasation, coagulation, consolidation, and necrosis.

BACTERIOLOGY

Many varieties of organisms are found in these abscesses: the different pyogenic cocci, various forms of streptococci, pneumococci, B. proteus vulgaris, B. coli, B. pyocyaneus, etc. Several cases have been observed in which anaerobic bacilli were found and also an acid fast bacillus allied to the B. tuberculosis. Our bacteriological knowledge of this condition, however, may be summed up in the statement that no special class of organism can be held accountable for it.

The causes of this condition may be divided into intra-pulmonary and extra-pulmonary.

Intra-Pulmonary Causes are: (1) Inflammation of lung tissue occurring in such diseases as broncho-pneumonia, lobar pneumonia, influenza, pleurisy, asthma, colds, typhoid, measles, scarlet fever, etc. In tuberculosis there is occasionally seen the so-called caseous abscess.

(2) Inflammation of lung tissue resulting from the inspiration or penetration of foreign bodies.

Extra-Pulmonary Causes are: (1) Direct extension from abscesses of adjacent structures, such as empyema, suppurating bronchial glands, mediastinal abscesses, echinococcus cysts, abscesses of the liver, and from malignant growths of adjacent organs.

(2) Infective emboli from distant parts.

An idea of the relative frequency of these various causes may be given by

*Read in Symposium on Lung Abscess, Section on Eye, Ear, Nose and Throat, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

quoting from W. S. Lemon's analysis of eighty-one cases seen at the Mayo Clinic. The causes of abscess in the eighty-one cases are summarized as follows:

Pneumonia	31
Colds, grippe, pleurisy, asthma, typhoid, measles and scarlet fever	19
Tooth extractions (general anesthesia)	7
Tonsillectomy (general anesthesia)	5
Appendectomy	2
Gastro-enterostomy	1
Gall-bladder	1
Excision of gastric ulcer	1
Trauma	2
Unknown	12

The channels through which infection may invade the lung in these cases are lymphatic, venous and tracheal. Although infection of lung tissue by way of the lymphatics is quite possible, I have not found in the reported cases any in which venous and tracheal infection are excluded and this pathway definitely proven as the mode of entrance of the infective material.

A familiar example of infection through venous channels is the formation of a lung abscess as the result of an embolus from a thrombosed lateral sinus. The cases of lung abscess resulting from the inspiration of foreign bodies such as tacks, seeds, etc., furnish good examples of the tracheal method of infection.

The cases which invite special study, from an etiological point of view, are those resulting from the inspiration of foreign bodies, and those following operations in the upper air passages. Our bronchoscopic friends have deeply impressed upon us the dangers arising from the presence of foreign bodies in the bronchi, and I shall not dwell upon this phase of the question.

The presentation of the numerous papers upon the subject of lung abscess following operations in the upper air passages has resulted in much discussion as to the causes of this complication. These may be classified under the following heads: (1) General condition of the patient, (2) anesthesia, (3) technic, and (4) special infective agents.

GENERAL CONDITION OF THE PATIENT

It is generally accepted that tuberculosis, diabetes and chronic alcoholism increase the liability to this complication. Other conditions mentioned by various writers are syphilitic processes, acute infections, advanced cardio-vascular changes, delayed coagulation time, high blood pressure, chronic bronchitis, bronchiectasis and virulent infections near the operative field.

ANESTHESIA

Fisher and Cohen's paper, mentioned above, shows that of the seventy-six cases of abscess of the lung following tonsillectomy, which they collected, seventy-four were done under ether and two under local anesthesia. These two cases originally reported by W. B. Porter, Richmond, Va. (*Virginia Medical Monthly*, March, 1921), together with two cases reported by John R. Simpson and Harry G. Noah, Pittsburgh, (*Pennsylvania Medical Journal*, March, 1920), and one case reported in the New York Academy of Medicine (*Laryngoscope*, February, 1921), from the service of Dr. C. G. Coakley, at Bellevue Hospital, are all the cases following tonsillectomy under local anesthesia I have been able to find. All of these patients, with the possible exception of the last, were tuberculous subjects.

By the kindness of Dr. E. R. Van Meter, St. Louis, I am enabled to cite the following case as the only pulmonary complication of any kind that I have been able to discover following tonsillectomy under nitrous oxid anesthesia:

Miss C., aged 18, was admitted September 13 with acute streptococcus tonsillitis and pharyngitis of two weeks' duration. Temperature, 104 degrees. Temperature dropped to normal in three days. Tonsillectomy was done under nitrous oxid anesthesia September 20 at 3:30 p. m. after a preliminary hypodermic injection of one-quarter grain of morphin. During the operation, owing to extreme depression of the lower jaw, the patient stopped breathing. As soon as the pressure upon the jaw was relaxed she gave a gasping inspiration which probably carried blood into the trachea, as the morphin had abolished the cough reflex. On the morning of the twenty-first there was bleeding from the left supratonsillar fossa, which was controlled by pressure. At that time the patient had a non-expulsive cough which she seemed to make an effort to suppress. She was given a quarter grain of

morphia hypodermically because of the cough and bleeding. That night her temperature rose and she complained of severe pains in the left side of her chest. The next morning her temperature was 104 degrees with signs of bronchopneumonia in the left lower lobe. She gradually recovered and was discharged convalescent October 13.

The question of whether lung abscess following throat operations under general anesthesia are due to inspiration of infective material, or to the lodging in the lung of infective venous emboli, is always a subject for spirited discussion. Dr. Charles W. Richardson believes that very few of these cases are of embolic origin, but are almost entirely due to the inspiration of septic material squeezed out of the tonsil at the time of the operation. He does not believe that general anesthesia plays an important role, and that these post-operative abscesses of the lung can be prevented by placing the head of the patient well down and using suction apparatus to keep the throat free from blood.

Henry L. Lynah, New York, believes most of these cases are due to inspiration of infective material. He also calls attention to the importance of considering the condition of the patient prior to the time of the operation, and states that in nine cases of lung abscess following tonsillectomy at the Lennox Hall Hospital, a careful review of the history showed that many of these patients suffered from post-influenzal bronchiectasis and coughed up pus for some time before their tonsils were removed. There were at least three cases of post-influenzal bronchiectasis that had been attributed to tonsillectomy. Again in general surgical operations he believes many of the abscesses may be due to inspiration of vomitus when the patient is coming out of ether. He mentions as an example a patient seen recently on whom Dr. Willy Meyer had operated for gall-stones, who inspired vomitus containing food, as he had eaten breakfast shortly before admission to the hospital. This patient developed acute lung abscess three days following the operation. He thinks that embolic abscesses most frequently follow long-standing pyemic conditions, such as sinus thrombosis and the like, and that in these cases the symptoms are violent and the patient succumbs in a very short time. He is convinced that inspiration of infected secretions or vomitus is responsible for the great majority of cases whether the operation is done under local or general anesthesia.

Dr. W. W. Carter, New York, regards these abscesses as due either to infected blood or detritus drawn into the lung during inspiration. He attributes the accident to a deficiency either in the construction or application of the apparatus used for suction during the operation. He condemns pressure ether narcosis, and, in adenoid and tonsil cases, considers it dangerous. He describes a suction apparatus used in Gouverneur Hospital, which has a soft rubber mouthpiece with a scalloped end, which he states keeps the field perfectly clean. He believes this to be the essential precaution which, if observed, will prevent lung abscesses following nose and throat operations.

Dr. Howard Lilienthal claims that if a lung abscess develops ten or twelve days after a tonsillar operation, it is proof positive that the abscess is due to inspiration of tonsillar detritus. He also calls attention to the fact that embolic abscesses of the lung are usually multiple and almost always fatal.

Dr. P. Samuel Stout, Philadelphia, believes that septic emboli are usually associated with severe pyemia and multiple abscesses, and are fatal.

Dr. W. B. Porter believes the two cases which he reported of lung abscess in adults following tonsillectomy under local anesthesia, both of which showed evidence of a co-existing tuberculous pathology, were more probably due to venous emboli than to inspiration of infective material.

Drs. Simpson and Noah believe the following points favor hematogenous infection in the two cases reported by them:

(1) Both were operated upon under local anesthesia in the upright position.

(2) The mouths and throats were in a septic condition before, and for some time after the operation. In Case 1 con-

siderable sloughing of the right tonsillar fossa and posterior pillar occurred.

(3) The late occurrence of symptoms points to a blood stream infection.

(4) The occurrence of the abscess at the site of the tuberculous lesion.

Dr. J. S. Unger, New York, believes that a thrombus is more apt to occur in cases where the blood vessel walls are kept from collapsing by the dense connective tissue existing around fibrous tonsils; and that the breaking up of this thrombus is more liable to occur during operations under ether than under local anesthesia, because, in the former case, the pharyngeal reflexes are abolished and the pharyngeal muscles relaxed so that they exert no constricting action about the cut and thrombosed vessels.

Dr. Coakley's case was done under local anesthesia with the patient's pharyngeal reflexes all present, and hardly enough bleeding occurred to stain a sponge, yet three days later the patient developed a lung abscess. The explanation offered was that this case might be due to an infected embolus in the lung.

Fisher and Cohen believe the majority of cases are due to infective emboli carried to the lung from the site of the operation, rather than to the inspiration of infective material through the bronchi, and cite in support of this opinion a series of thirty-one cases of lung abscess in the Pennsylvania Hospital, compiled by Norris and Landis, nineteen of which were due to emboli brought to the lung through the circulation, as follows:

Vegetative endocarditis infarct	6
Otitis media	2
Otitis media and thrombosis of the lateral sinus	2
Mastoiditis	1
Thrombosis of the portal vein	2
Thrombosis of the iliac vein	1
Abscess of the kidney	1
Abscess of the lip	1
Abscess of the pharynx	1
Abscess of the seminal vesicle	1
Abscess of the skin	1

They state that brain abscesses have followed tonsillectomy, and that they were of metastatic origin. They report a case of lung abscess which developed from a rather mild attack of Vincent's angina. They also mention the occurrence of cases of septic arthritis and osteo-myelitis ushered in with an attack of acute tonsillitis, the infection being of hematogenous origin.

Despite the many arguments pro and con the seventy-six cases reported by Fisher and Cohen indicate that ether does play an important role in the causation of this complication. While the evidence so far amassed points to the fact that both embolic and inspiratory infections are possible, most of the arguments advanced in favor of venous emboli from the site of the operation suggest the possibility of this method of infection, but do not exclude infection by way of the trachea.

That so vast a majority of these cases occur under ether anesthesia points to the fact that there is an added danger of this complication in the use of ether as an anesthetic in operations about the nose and throat, and that this added danger is not in the increased probability of dislodging infective thrombi, but in the liability of inspiration of infective material while under the influence of the anesthetic. Whether this is due to the depth of the anesthesia, the position of the patient, or to neither of these factors, we cannot ignore the proportions of seventy-four to two.

At least four of the five cases occurring under local anesthesia were in known tuberculous subjects, and the anesthetic could scarcely have been a causative factor.

The solitary case of broncho-pneumonia following tonsillectomy under nitrous oxid anesthesia directs attention to the relative safeness of this anesthetic, and even in this one case we must remember that the operation was performed only a few days after an acute streptococcus tonsillitis and pharyngitis, and that the cough reflex was abolished by a preliminary hypodermic of morphin.

TECHNIC

The errors in technic which may be causative factors are

(1) Excessive manipulation of the tonsils;

(2) Undue laceration of the fauces;

(3) Prolonged operations;

(4) Deep anesthesia;

(5) Failure to have the head lower than the body during the operation, if done under general anesthesia;

(6) Failure to guard against inspiration of blood between the conclusion of the operation and the complete recovery of consciousness if a general anesthetic has been used;

(7) Failure to use an efficient suction apparatus;

(8) The manipulations sometimes necessary in controlling hemorrhage; and

(9) The use of motor-driven ether apparatus.

SPECIAL INFECTIVE AGENTS

Manges, Stout and Simpson, in calling attention to the fact that several of these cases followed each other in quick succession in the same hospitals, suggest the possibility of some special infective agent present at that time in those institutions.

PREVENTIVE MEASURES

In foreign body cases, preventive measures consist in the discovery and prompt removal of the offending substance, through the bronchoscope, and in the exclusion of an unsuspected foreign body in obscure pulmonary conditions.

To prevent cases occurring after operations in the upper air passages, precautions should begin with a careful physical examination, and, except for very urgent reasons, the patient should not be operated upon unless he is in good condition. Tuberculosis, alcoholism and diabetes add materially to the danger of this complication. Tonsillectomy in an adult must not be regarded as a minor operation. The use of ether should be avoided in these operations if possible, but, if used, the anesthesia should be light, an efficient suction apparatus employed to keep the throat as clear of blood and detritus as possible, the patient placed in some position in which the blood cannot flow down the trachea, and, after the operation, be kept on the side or prone until consciousness is thoroughly regained. The writer believes that if a general anesthetic is necessary nitrous oxid is safer than any other in operations upon the nose and throat. The question of giving hypodermic injections of morphin, or drugs of similar character, before the operation, must be carefully considered because of the fact that they abolish the cough reflex and thus add to the possibility of inspiring infective material. Patients should not be operated upon too soon after an attack of acute tonsillitis. At least two weeks ought to elapse before any operative interference is undertaken.

The bleeding following tonsillectomy will nearly always cease if left undisturbed for a few minutes. Consequently, any swabbing or manipulation of the tonsillar fossae should be avoided, if possible, to prevent the dislodging of any thrombi which have formed in the cut veins.

In brief, the operative technic should be so planned as to minimize the possibility of the inspiration of infective material into the bronchi and the dislodging of venous thrombi from the site of the operation.

The forcing of fluids should be a routine measure for the rapid elimination of any toxemia which may ensue.

In conclusion, the writer desires to emphasize the fact that despite the numerous papers upon this subject in the last few years, abscess of the lung is a rare complication of nose and throat operations; but its seriousness, when it does occur, is so great that every precaution should be taken to prevent its occurrence.

Discussion follows paper of Dr. Giese, page 762.

ON THE CLINICAL COURSE AND DIAGNOSIS OF POST-OPERATIVE PULMONARY ABSCESS*

By Charles L. Minor, M.D.,
Asheville, N. C.

In recent years laryngologists and rhinologists, as well as internists, have taken a lively interest in the question of the occurrence and etiology of pulmonary abscess. A study of the literature from Laennec until 1910 and 1912, when Richardson reported the first cases of post-tonsillectomy pulmonary abscess, will show that while much good work had been done, notably by Tuffier, Quincke, Leyden, Lenhartz, Fraenkel, and Sokolowski, it was not then a subject of intense interest and study, and post-operative pulmonary abscess was not referred to.

The increase of interest in recent years has not been due to any increase in those cases which follow pneumonia, pyemia, empyema, tuberculosis, wounds, etc., but to the reports that have become so frequent lately of pulmonary abscess following naso-pharyngeal and even dental operations.

A review of the literature of the Nineteenth Century upon pulmonary abscess shows that apparently such operations played no part in its etiology, and though inhalation pneumonia was recognized as a causative factor, as were also foreign bodies in the bronchi, they apparently were considered to have an unimportant relation to the etiology. However, in this century since the great increase in tonsillectomies and other naso-pharyngeal operations, and especially since general anesthesia has come into common use for such cases, pulmonary abscess has become frequent and lung specialists are encountering it often.

The connection of many of the cases with the use of general anesthesia in nose and throat work seems proven, though how it acts is not as yet settled. The anesthetic itself, the position of the patient, the lodgment in the lung of septic thrombi from the veins of the operative area, the inhalation of septic matter from the wound or mouth, the use of motor-driven ether apparatus, all have been accused, and the fault satisfactorily fastened upon none, though the evidence is strongly in favor of inhalation as being responsible for the majority.

So long as we are not entirely certain of the etiology of this type of pulmonary abscess, our prophylaxis must necessarily be uncertain and ineffectual, and it is most desirable that physicians and surgeons who see different aspects of this problem should meet to discuss the matter. I am sure that a time is coming when a post-operative pulmonary abscess will be regarded as a severe indictment of the surgeon. However, we as yet need much more knowledge on the subject before he can justly be saddled with the responsibility.

My opinion is that these abscesses are chiefly the result of the inhalation of septic matter from the field of operation or from the mouth, and to a much less degree to the carrying of a septic venous thrombus from the field of operation into the lung. Single emboli do not produce the multiple abscesses seen in embolic abscesses which occur in the course of pyemia, and while the frequent and increasing use of a general anesthetic is, I believe, largely responsible, it is not to the anesthetic itself that we must look for the origin of these oases. It is to the unconsciousness the ether produces and to the desensitization of the fauces, epiglottis, larynx and trachea, which deprives the patient of cough, Nature's protection of that area, and which, therefore, allows septic matter from the field of operation or the mouth to enter the larynx unopposed and to descend into the lungs. Furthermore, the irritation of the mucous membrane of the bronchi, which ether produces, undoubtedly has some part in favoring an inflammatory process.

In view of the fact that local anesthesia does not abolish this protective cough or tracheal sensitiveness, it should, despite the possible decreased

*Read in Symposium on Lung Abscess, Section on Eye, Ear, Nose and Throat, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

comfort of the surgeon, be the anesthesia of choice where there are no distinct contraindications. When ether is used, it should be considered essential that the patient be operated upon, as Richardson advises, with the head lower than the shoulders. Insofar as pulmonary abscess is due to a septic embolus from the field of operation, this will not be effectual, but the results reported where this is the practice and the great preponderance, as I believe, of inhalation cases, show that we have a right to expect it enormously to lessen the incidence of this largely preventable disease.

Turning to a consideration of the clinical course of the malady, were I to endeavor to enter upon a discussion of the peculiarities of the course of abscesses arising from the varied causes I have noted aside from pneumonia and naso-pharyngeal operations, I should have far too large a field to cover and should be dealing with things that would not interest a laryngological and rhinological association. Moreover, those abscesses arising from pyemic emboli, wounds of the chest, extension to the lung of other suppurations, bronchiectasis, etc., form a very small part of the total of such cases. Hamman, in his excellent article in the "Oxford System," ascribes 95 per cent to pneumonia or to operations.

I shall first discuss very briefly abscesses following lobar pneumonia, though they are quite rare, and then dwell more fully upon post-operative cases. I have been able to put my hand upon but twelve cases in our files since 1914, though I have had many more. Of these twelve, five were the sequel of a pneumonia and seven of operations.

The post-pneumonia abscess was that which was first investigated and on which Laennec built his classic study of pulmonary abscess, but such cases are not so common as the other, Fraenkel reporting only 2 in 1200 cases.

Some have denied that abscesses ever occur in plain uncomplicated pneumonia. They are said generally to be found in people who are much run down or who are alcoholics or diabetics, though none of my cases came under that category. The course of the pneumonia is said to be generally severe with much prostration, but in my cases I have not usually seen excessive exhaustion. The crisis is either incomplete or does not occur, the fever type changes and takes on an irregular course and septic character, which suggests enclosed pus and which is corroborated by the leukocyte count. There are high evening temperature rises and morning remissions and chills and one may fear the beginning of an acute tuberculosis. The sputum loses its pneumonic character, and, according to Fraenkel becomes grass-green and very abundant. The patient loses strength rapidly and the dullness, bronchial breathing and rales do not clear up. In this type there may be no typical bursting of the abscess, but rather a gradual steady increase of profuse purulent sputum. The final results are rather better than in the other forms.

In post-operative cases we have a very different picture. The symptoms begin usually in the first week after the operation, but in one of my cases as early as six hours afterward. In others the symptoms are postponed as long as two months. There is pain in the axilla, if the abscess is in the upper lobe. The temperature rises, a cough appears, which in my experience is typical, becoming after a few days very hard, violent and harassing, similar to the cough we get when a tuberculous pulmonary abscess forms. It is not relieved by anodynes. The physical examination shows nothing typical, and though dullness and bronchial or feeble breathing with a few fine crepitant rales can at times be made out, my charts were often nearly negative. The blood shows a pronounced leukocytosis and the sputum is scanty. About the eighth to the fourteenth day, usually during a violent coughing spell, the abscess bursts explosively and the patient brings up a great and almost strangling gush of creamy, green, odorless pus, with blood streaks or even some blood, and our suspicion becomes a certainty. Almost at once the picture changes, the tem-

perature falls notably, the cough greatly lessens, and the patient looks and feels like a new person. If the evacuation has been complete, tympany, cavernous breathing and moist rales may be found in the place of dullness and feeble or bronchial breathing, and the x-ray may now show a cavity with fluid contents instead of the more or less globular shadow which is found in a number of cases before rupture. Such a change is diagnostic. The globular shadow, while not diagnostic by itself, is very suggestive.

This transformation in the clinical picture does not last long. The expectoration begins to diminish and may even cease. The fever, as the pus recollects, again becomes septic, the cough returns and the whole cycle is repeated. In favorable cases, the second and subsequent cycles, while like the first, are progressively less severe. Each time the amount of pus evacuated grows less, though it is no longer odorless and may develop a very offensive odor if drainage is poor. The intervals between evacuations grow longer and longer, the fever periods shorter and less high, leukocytosis lessens, and by the second or third month, usually before any clubbing of the fingers has occurred, the symptoms clear up and the patient makes a good recovery.

I have had several such fortunate cases and many are reported in the literature, but more often the result is not so happy. In these the expectoration persists and often is very foul-smelling, and though the odor can never be confounded with that of gangrene, I have known it to render the sick room very malodorous. The temperature remits, but does not disappear. The patient becomes very pale, flesh does not return, the fingers show pulmonary osteo-arthropathy, and the patient enters on that miserable condition of chronic pulmonary abscess in which surgery alone offers any hope. Pneumothorax does not avail after the abscess wall is thick, stiff and uncollapsable, as it becomes in chronic cases.

It is safe to say that patients who do not show any gain in two or three months will not recover without surgical assistance and that expectant treatment after that time only subjects them to the danger of death from exhaustion, pulmonary hemorrhage or metastatic cerebral abscess and the doctor should never be too tardy in calling in the surgeon. It would seem strongly indicated that patients who have undergone naso-pharyngeal operations, especially tonsillectomies, should be followed closely for two weeks or a month for suspicious symptoms, as some cases develop very tardily. Burger has advised that tonsillectomy patients be kept in bed under medical supervision for a few days after the operation, an excellent idea that few will follow in this impatient age and country.

The diagnosis of post-operative abscess is not usually difficult. When after a naso-pharyngeal or dental operation fever develops, followed by cough and pain in the side, with possibly an area of dullness, feeble breathing and rales, and a leukocytosis is found, every surgeon should be on the lookout for the possible formation of an abscess. Physical diagnosis, as I have noted, gives no infallible data, but a fluoroscopic examination or a good pair of stereoscopic x-ray plates can be of inestimable assistance in most cases. It is both wise and safe, as they so generally burst outward through the bronchi, to wait two weeks, or even three, for the bursting of the abscess, which clinches the diagnosis and which may initiate a spontaneous cure. Even before the rupture, I consider a hard, uncontrollable paroxysmal cough a very valuable diagnostic hint, which was not absent in any of my cases. After the rupture, if further confirmation is needed, the cyclic variations I have already spoken of are very typical in my experience, yet are not noted save by Hamman. In the presence of ameliorating cyclic symptoms, it is perfectly safe to wait on Nature, whereas when they aggravate, artificial pneumothorax, or, if it fails, surgery, is strongly indicated.

Next to the explosive evacuation of pus after a short febrile course, the macroscopic and microscopic nature of

that pus is our best diagnostic guide. Macroscopically we find a creamy green pus, though in post-pneumonic cases it may be pinkish brown, with bloody streakings, odorless unless the case be old, and showing small particles of greyish, reddish, or green lung tissue. Allowed to stand, it separates into three layers, the bottom of pus and tissue debris, a middle serous, and a frothy top layer.

Under the microscope we find elastic fibres in alveolar arrangement and Aufrecht considers them essential to a diagnosis. There are also large numbers of rhombic or needle-like reddish brown crystals or hematoidin which Leyden considers diagnostic. Dietrich's plugs are also only found in abscess or gangrene. Sooner or later the patient develops the clubbed fingers of pulmonary osteo-arthropathy. The diagnosis has usually been made before they appear, though at times they are seen very early. Physical diagnosis as noted is not of very great assistance before the pus is evacuated, but after this it is valuable as we get the picture of the replacement of dullness and feeble or bronchial breathing and crepitations by tympany, cavernous breathing and moist rales, which may again disappear if the sputum is retained.

The x-ray has added an invaluable procedure to our diagnostic methods. A fluoroscopic examination and a pair of stereoscopic plates are essential in every case, more especially if operative interference is contemplated.

Rieder says:

"Lung abscess and lung gangrene often give, at least in their early stages and development, pictures which are not very characteristic. In such cases they can be mistaken for tuberculosis, bronchiectasis, encapsulated exudates, neoplasm, etc."

But while the x-ray is not so certainly diagnostic as is the sudden discharge of pus or the microscopic findings I have noted, it has won for itself an unquestioned place in our diagnostic procedure, especially since in the location of the abscess physical diagnostic measures often leave us in the lurch.

When the patient can stand up and be fluoroscoped, the discovery of a more or less globular mass of shadow, which after pus is discharged is replaced by the shadow of a cavity with or without fluid, in connection with which such a history as I have given, is final. Where the abscess is located in the upper lobe, and so good an authority as Tuffier found them so in 80 per cent of his cases, diagnosis is easy. In the lower lobes it can be very difficult and the case cannot always be distinguished from an empyema discharging through the mouth, a tuberculous cavity or a bronchiectasis. The absence of elastic fibres and hematoidin crystals and especially the history, which is different and much longer in these latter, and the discovery of bacilli, are of assistance.

In eleven of our twelve cases of which I have been able to find my notes, I have record of a more or less globular shadow, four times in the upper lobes and seven times in the base. Similar shadows are reported by others. These shadows were not sharply contoured, though their general outline was either distinctly globular (9 cases) or spindle-shaped (2 cases). In none were there any shadows that suggested tuberculous involvement, though the haziness of pleural thickening was present in two. While I would not say that the shadows were diagnostic, they would inevitably suggest an abscess to one familiar with x-ray work. After evacuation we may have a typical cavity shadow. A good picture of the "before and after" of this condition is to be found in Norris and Landis' "Diseases of the Chest," page 461. Where pus collects and is retained, the cavity shadow may again lose its clear central area. Of course there is nothing to distinguish the cavity shadow *per se* from that of a tuberculous cavity, but in the latter other parts of the lung show the picture we find in tuberculosis and in the sputum we find bacilli, while in abscess the rest of the lung is usually clear and bacilli are wanting.

Many abscess shadows, especially in the base, give a very general shading, are not globular, and suggest fluid in the pleura. Manges[12] in his excellent paper, recommends the bronchoscope as

an aid in diagnosis and cites some interesting cases.

The chief diagnostic features have been very clearly stated by Carr[18] as:

(1) The constitutional symptoms of an infection.

(2) The character and the amount of the sputum and the presence of elastic fibres (to which I would add the suddenness of the evacuation and the presence of hematoidin crystals).

(3) An etiologic factor.

(4) Signs of pulmonary infiltration.

(5) X-ray findings.

(6) Leukocytosis.

And I would add lastly,

(7) A cyclic course with remissions and recurrences.

I shall here give in brief a few typical histories from my practice, leaving out everything but the essential details. I might note that a carefully-taken history is a very important factor in this diagnosis.

The following excellently recorded and very typical history by the patient's doctor was brought with him:

CASE REPORTS

Patient, J. P. S. On January 23 his tonsils were removed under general anesthesia. Both were very badly diseased. Six hours after the operation the patient had a hard chill lasting thirty minutes, after which his temperature went to 103 degrees. Then for an hour he had a profuse sweat, the temperature gradually falling until it reached normal, twelve hours after the operation. (The history of trouble developing within six hours after the operation suggests an embolic rather than an inhalation infection.) On January 5 he had herpes on his upper and lower lips. On February 1 he began to have cough and to spit up offensive sputum. On the next day, February 2, he had fever, and the sputum was yellow. That night he had a severe sticking pain on coughing and deep breathing in the lower right chest. He coughed up offensive, blood-stained sputum. Temperature, 100 degrees. Friction sounds were made out just under the angle of the right scapula. February 5, the pain was better, the friction sounds could just be heard in one place; the cough was better; and the sputum was less in amount and less offensive.

On February 11 (the nineteenth day) he was still coughing up offensive sputum and was pale, but felt well enough to try to go to work. His white blood count was 23,200. That night he had a chill and his temperature went to 102 degrees. His sputum was negative for tubercle bacilli. On February 13 (the twenty-first day) nothing could be found in the lungs but bronchial rales. Nothing was found at either apex. February 18 (the twenty-sixth day) an intradermic tuberculin test was negative. Temperature was normal and he was bringing up less purulent sputum. On February 19, the sputum was negative for tubercle bacilli, but full of cocci. The patient came to Asheville February 26 (the thirty-fourth day) and was bringing up two cupfuls of offensive blood-tinged sputum. There was no fever. His voice was husky since tonsillectomy. He had a good appetite. His sleep was poor on account of cough. His strength was improving. There was much rattling and wheezing in his chest. Physical examination was practically negative, but the x-ray showed a globular shadow at the right base. On March 5 (the forty-first day) the patient was gaining strength and his expectoration was whiter and less offensive. There was no fever; the pulse was normal; and he walked four blocks easily, but was eating poorly. March 26 (sixty-second day) expectoration had practically stopped. What little there was, had no odor. There was a bad wheezing in the chest, but no other physical signs, and he ate well. April 2 (sixty-ninth day) the wheezing was much less. April 16 (eighty-third day) the patient had stopped wheezing. There were no signs of sickness. February 28 of the next year the patient reported himself as working seven to eight hours a day at office work and had had no further pulmonary symptoms.

Patient, R. L. N., was first seen March 28, 1921. His tonsils had been removed July 3, 1920, under ether anesthesia. His throat healed, but four days after operation he developed a pneumonia. He was sick for three weeks and had profuse foul expectoration while in the hospital. He was told he had had a pulmonary abscess. Fever continued from August to October, 1920, running from 98 to 102 degrees. A vaccine made from his sputum was used, which reduced the temperature to normal, and after November he had rarely had any fever. His general condition was good. His condition on March 28 was slight cough and expectoration without odor; he had spit blood within a day or so; there was no fever; his appetite and digestion were good; his general condition was excellent; and he felt better than he had for ten years. By April 19 he had gained five pounds, which constituted his maximum weight. There was still a little blood streaking and some odor at times in his sputum. He was eating well; his cough was rare; and his strength was good. This patient went on to an uninterrupted recovery and went home cured on June 27, at which time there were no physical signs left save a little impairment of resonance over the right apex posteriorly and down to the mid-scapula with feeble breathing.

Patient, G. Q., had had influenza in the fall of 1918, when he was sick for ten days, but had no pneumonia. She had been strong and well since that time, though she coughed for two months after the attack and was rundown. In August, 1919, the tonsils were removed under ether. Four weeks after the operation she had pain in her chest with cough and expectoration, which gradually became profuse and very foul. This condition lasted for six weeks. Up till Christmas, 1919, she felt fairly well, though weak. In January, 1920, she had a return of

the pain and fever, a cough and expectoration, and that condition had persisted ever since. There had been blood streaking, but no frank bleeding. I advised the patient to have an operation performed, but though she at first consented and went to New York to consult Dr. Howard Lilienthal, she finally backed down and went home. In July she weighed only seventy-five pounds, when the abscess burst and she had great relief. After that she improved and in two and a half months was in excellent shape. Physical examination showed dullness all over the back of the right lung and over the apex to the third rib in front. There was feeble breathing over that area with a few fine dry crackles. She reports now only a slight cough and no expectoration. She feels perfectly well.

The following is a history of a bad chronic case, the last report from whom was unfavorable. Mrs. R. L. B. had had a tonsillectomy performed under ether on November 6, 1918. Five days later while out driving (this patient evidently had not been properly followed) she fainted from severe pain in the right interscapular region. The pain had persisted intermittently in that region ever since, so that she had been dependent upon morphin. November 21 the patient began to cough and expectorate large lumps of heavy, putrid, green pus. The cough was severe and paroxysmal, requiring morphin to control it. There were sweats, but no temperature until December 15, when she had a temperature of 104 degrees, followed by the expectoration of putrid blood. The fever dropped and she felt better. On January 15 there was severe hemorrhage, repeated on January 18. This patient's course showed very well the cyclic feature of which I have spoken, only the cycles were progressively worse. She refused operation and went to Wyoming. My last report from her was that she was doing badly as an old chronic abscess case. It was this case that I referred to as making the room very offensive with the odor of her sputum. Her coughing spells were very severe and scarcely to be controlled.

Miss I. M., in January, 1916, while grippe was prevalent in her community, had a fever, high pulse, and pain in the right side low down. She felt very sick and in one week developed pneumonia. She had a cough with slight expectoration and her fever went to a hundred and four. On arrival, February 24, the patient was running fever up to 103 or 104 degrees with sweats, chills and prostration, and she had no appetite. On April 14 she discharged an abscess with profuse but odorless expectoration. The temperature at once fell; she began to gain; and with one or two setbacks, made steady progress upward. By June there were no symptoms of any sort and she was sent home cured.

A. M. A. on January 12, 1914, had "typhoid fever," with which he was in bed for twenty-four weeks, running a high temperature. Nine weeks after the onset, he felt something burst inside himself and yellow pus poured out of his mouth. The fever dropped from 103 to 101 degrees. He then coughed and expectorated freely and had done so ever since, the date of this history being July 24. He had run some temperature since that time, and though he lost much weight, had recently gained back thirty pounds. Strength was poor on July 24. The appetite was good. The cough was moderate. Sometimes there was no sputum; sometimes a cupful. Temperature went to over 100 degrees. There were sweats at times. This patient did very well. By September 28 my notes show expectoration of two drams of yellow pus with no bacilli. His appetite and digestion were good. He was able to walk an hour. There was no pain. By October 12 his weight was normal. He had slight cough and expectoration; no temperature, and was sent home cured.

The prognosis is undeniably grave, yet with closer attention to the details of naso-pharyngeal operations, careful after-attention, the early use of the x-ray, the use of pneumothorax and surgery in obstinate cases, our results must be better than they could be under expectant treatment alone, and even some cases expectantly treated show the wonderful recuperative and healing power of Nature. Naturally a single abscess has a better prospect than multiple where the prognosis is very bad. Multiple abscesses are not found after operations, but in the course of pyemia. The occurrence of an empyema is not a very serious matter, since by a simple operation simultaneous drainage of it and of the abscess can be brought about. Free hemorrhage has of course a very serious effect on prognosis, but early diagnosis and rational treatment of cases of lung abscess will make such complications rarer and rarer. Embolic meningitis, of course, is fatal.

As a result of modern methods, not only should we see fewer abscesses, but those which do occur will be suspected and discovered early. And we all know that early diagnosis is the first step toward satisfactory cure.

Let me urge upon you, then, to watch your tonsillectomy cases more closely than ever, to treat them as serious operative risks in which no precautions are too troublesome to take, and to remember that on your quick recognition of the first symptoms may depend the patient's future health and often his life.

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any one wishing to study the subject should know, and have added a few important journal articles on the subject.

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Discussion follows paper of Dr. Giese, page 762.

THE TREATMENT OF LUNG ABSCESS*

By Chas. O. Giese, M.D.,
Colorado Springs, Colo.

In taking up the treatment of lung abscess as a part of this Symposium, I feel only partially competent to speak, since I make no claim whatever to operative efficiency. What I may offer, therefore, must be viewed from the standpoint of the internist and diagnostician.

WHEN TO CONSIDER OPERATION IN LUNG ABSCESS

Equally competent observers report that from 6 to 33 per cent of all cases of lung abscess recover spontaneously. This discrepancy in statistics appears to vary with the types of cases observed, and also with the time at which they came under observation. Since thorough and continuous drainage of such an abscess is essential to its recovery, it is evident that, other factors being equal, the lung abscess that can and does empty itself thoroughly and continuously is most likely to spontaneous recovery, that is, recovery without surgical interference of any sort. Lung abscesses recovering in this manner can drain in but one way, namely, through the bronchi. The larger bronchi are found near the root of the lung, and it follows from this that abscesses of the lung so located that they can and do rupture into a bronchus near the root will, in most instances, drain satisfactorily. In addition to this it is necessary that the abscess be located entirely in close proximity to such a good size bronchus. Large abscesses approaching the periphery but extending to and rupturing into a large bronchus, do not drain sufficiently well. In other words, the location of the abscess has a most important relation to spontaneous cure. The results of physical examination can ordinarily be correlated with the above facts. In a general way, lung abscesses giving few or no physical signs are most prone to spontaneous recovery. The deep lying abscess which does not approach the periphery is the one most likely to drain itself. In such cases the patient's symptoms of cough, expectoration, fever and prostration may be most pronounced. Few or no physical signs, but with definite symptoms and definite diagnosis, particularly if verified by properly taken x-ray pictures, must be taken into careful consideration in advising operative procedures.

Our next consideration is how long to wait for spontaneous cure and how long to postpone consideration of any type of operation. Garre and Quincke state that this period should not exceed eight weeks, and Wessler in 100 cases observed by him gives approximately the same period. Spontaneous recovery appears to be rare after eight weeks' duration. If this does not occur, or in the opinion of the physician the location and size of the abscess, and the condition of the patient, make spontaneous recovery unlikely, or further delay undesirable or dangerous, what type or types of operation should be advised?

BRONCHOSCOPY AND POSTURAL DRAINAGE

Deeply located lung abscesses not draining sufficiently for cure naturally

*Read in Symposium on Lung Abscess, Section on Eye, Ear, Nose and Throat, Southern Medical Association, Fifteenth Annual Meeting, Hot Springs, Ark., Nov. 14-17, 1921.

lend themselves most favorably to bronchoscopy and although bronchoscopists assert that it is rare to have a bronchoscope enter a definite abscess cavity, yet if the bronchus draining that cavity can be found, proper dilatation and suction, together with irrigation through the bronchoscope of various antiseptics, will often sufficiently aid Nature's attempts to insure recovery. This procedure in appropriate cases is all the more advisable since deep lying abscesses are difficult of approach by external operation, surrounded as they are by a considerable area of non-infected lung tissue. The pleura in such instances is ordinarily not adherent, which adds to the difficulty of operation. If induration and resulting bronchiectasis has not taken place in such an abscess, a point of pathology to be considered later, bronchoscopy with suction and irrigation, supplemented by postural drainage is exceedingly satisfactory. Postural drainage in all cases, whether drained through a bronchus or through external incision, if properly applied, is of value at least in the alleviation of symptoms.

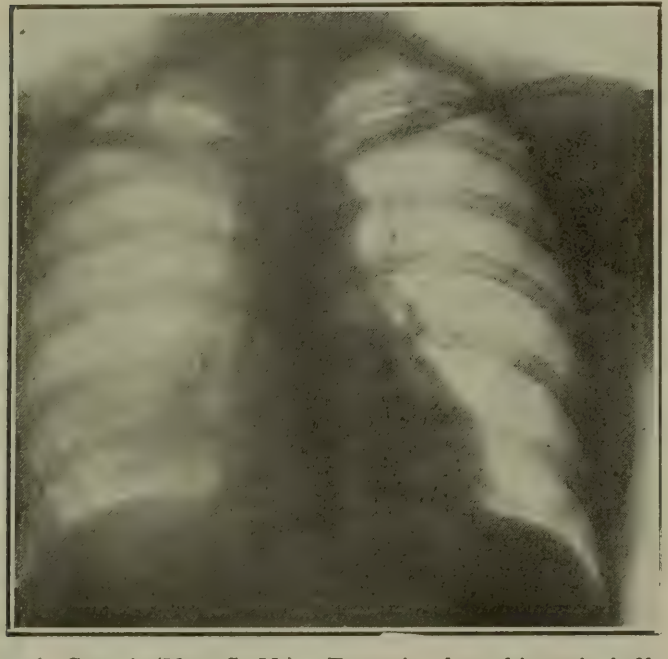

Fig. 1, Case 1 (Mrs. C. M.). Extensive bronchiectatic infiltration at the base of the right lung. Thickened, calcified bronchial glands in the left hilum. Obliteration of the cardiaphrenic angle on the right side, due to beginning cylindric bronchiectasis.

EXTERNAL OPERATIONS

Artificial Pneumothorax.—Diffuse, purulent infections of the lung, or as they have been so frequently called, chronic non-tuberculous lung infections, in my experience lend themselves best to treatment by artificial pneumothorax. This type of case is commonly referred to as lung abscess, but it seems to me improperly so, since no definite abscess cavity can be demonstrated. Neither do they tend to induration or bronchiectasis over a long period of time. The clinical history is one of cough, gradually increasing in severity, with marked expectoration, slight fever, some loss in weight and frequent hemorrhage. The sputum is mucopurulent in character, but not foul smelling. The physical examination discloses dullness and many moist, coarse rales, generally at one or both bases. The x-ray shows the characteristic shadows. The pleura ordinarily is found to be free and the pathology is that of a generalized, not localized, suppurative process, often unilateral. In distinction from the ordinary lung abscess, induration does not occur, nor does bronchiectasis, even after a long period. Cases 1, 2 and 3 illustrate this type, and it is only in this type of case that in my hands artificial pneumothorax has been decidedly effective, i. e., in chronic, unilateral, generalized, suppurative condition of the lung, with-

Fig. 2, Case 5 (Mrs. A. P.). Drainage tube inserted in second interspace anteriorly draining localized lung abscess, with resulting bronchiectatic infiltration above the tube. Thickening of the pleura at the base, with high fixation of the diaphragm on the right.

out definite abscess cavity, or resulting induration or bronchiectasis. Artificial pneumothorax is contraindicated and of no avail in indurative and bronchiectatic cases.

Thoracotomy, Extensive Rib Resections and Lobectomy.—Lung abscesses not recovering spontaneously, not suitable for or yielding to bronchoscopy and not suitable for treatment by artificial pneumothorax must be attacked, if attacked at all, in a more formidable manner. This is the type of case most frequently seen in health resorts and represents by far the larger percentage of my series.

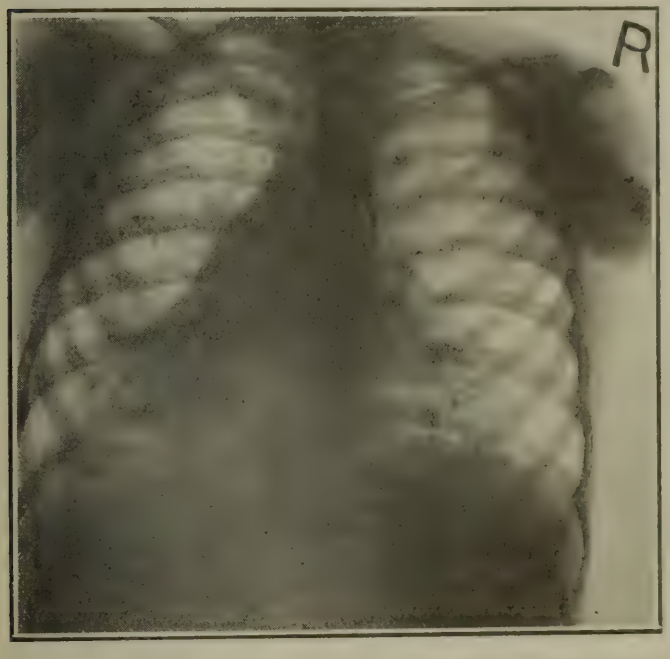

Fig. 3, Case 6 (Master P. M.). Extensive peribronchial changes involve practically the entire right lung, with bronchiectatic infiltration at the base of the lung, obscuring the heart angle. A similar change is seen on the left side. Beginning cylindric bronchiectasis.

The type of operation advisable in such a case demands careful consideration, and complete answer if possible prior to operation, of several questions. The first question to be answered is the exact pathology present. We know the pathology of lung abscesses varies during the course of their existence. It varies apparently with the time of existence, the type of infection predominant in the abscess, and perhaps with other factors with which we are not fully familiar. At any event, during the early life of a lung abscess, breaking down of lung tissue is found with one or more well established cavities but with little or no induration or bronchiectasis. Later, induration occurs, the bronchial walls become thickened and the bronchi dilated. It is evident from this that an operation suitable at one period is totally unsuitable and not to be advised at a different period. Determining the pathology present is an essential factor in deciding the type of operation to be performed. In most instances, but not in all, abscesses that have existed for a year or more are not suitable for simple thoracotomy. Cases 4 and 10 are exceptions to this rule. The time the abscess has existed, physical examination, character

Fig. 4, Case 8 (Mr. J. H.). Extensive fibrotic infiltration in the right upper lung, with a localized area of increased density extending from the second interspace anteriorly to the diaphragm. This is circumscribed and reaches from the pericardium to the lateral periphery, and has ruptured into the pleura, producing an empyema. The pleura is adherent at the costo-phrenic angle. High fixation of the diaphragm. Diagnosis: Lung abscess, with rupture into pleural cavity.

of the sputum and the x-ray pictures, must all be taken into careful consideration.

Our next question is to decide whether or not the pleura overlying such an abscess is adherent or free. This subject has received the attention of all writers on lung surgery, and attention has been called to the fact that we have no satisfactory means of knowing whether adhesions exist over the abscess or not, whether it is safe for the surgeon to go directly into the abscess with a cautery

or knife, as he chooses, and if so at what point he can safely enter. The procedure in the hands of many surgeons has been to resect a rib or ribs, inspect the pleura, and if found to be free to resect further and search for the adherent area. Information secured by x-ray and physical examination in regard to the presence or absence of pleural adhesions is quite inadequate. It is with a view to aiding the surgeon in this respect that for some years past in locating the most favorable site for operation in lung abscesses I have used very successfully the following procedure. By physical examination and x-ray examination, principally by percussion, one determines the point at which the abscess most nearly approaches the chest wall. Ordinarily this is the point of greatest dullness. We take the ordinary artificial pneumothorax outfit and introduce the pneumothorax needle at this point, watching the water monometer for negative pressure and for oscillation. If no oscillation is secured at this point, or if oscillation both above and below zero is secured, and we are unable to affect a change in the pressure by the withdrawal or introduction of a small amount of air, we feel that we have established the presence of adhesions. We then go to one side or the other for a distance of two or three centimeters and try again, in most instances going laterally until a definite free pleura is found, as is evidenced in the monometer by a definite negative pressure, with oscillation. The last point at which oscillation does not occur is the distance the surgeon may safely go in that direction. By securing a number of points in various directions we are then able to graphically outline on the chest wall an area over which we feel sure the pleurae are adherent, and can mark out for the surgeon how far he may go without danger of entering a free pleual cavity, and producing a spontaneous pneumothorax. Naturally the result of this determination is more important where thoractomy is intended than for extensive resection, although in any event it is valuable information for the surgeon. I do not mean to infer, of course, that where pleural adhesions do not exist the abscess should not be attacked, as it is well known this can be done either by a two-stage operation or by direct suturing of the pleura. The adherent area outlined prior to operation need not necessarily be large. In Case 10 the adherent area did not exceed 5 cm. in diameter in any direction; yet thorough drainage was secured and complete recovery resulted.

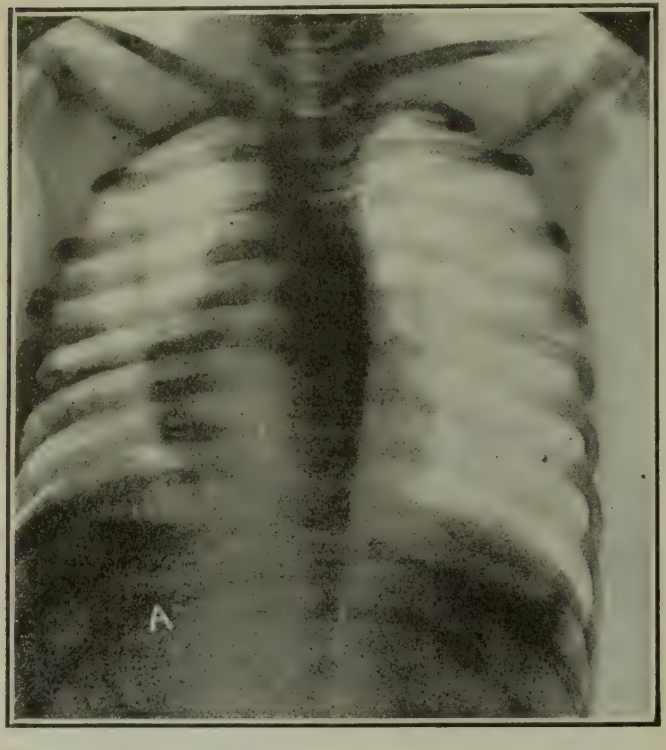

Fig. 5-A, Case 9 (Master H. K.). First appearance of patient with no definite findings except a modified interstitial tissue infiltration at the right upper lung field.

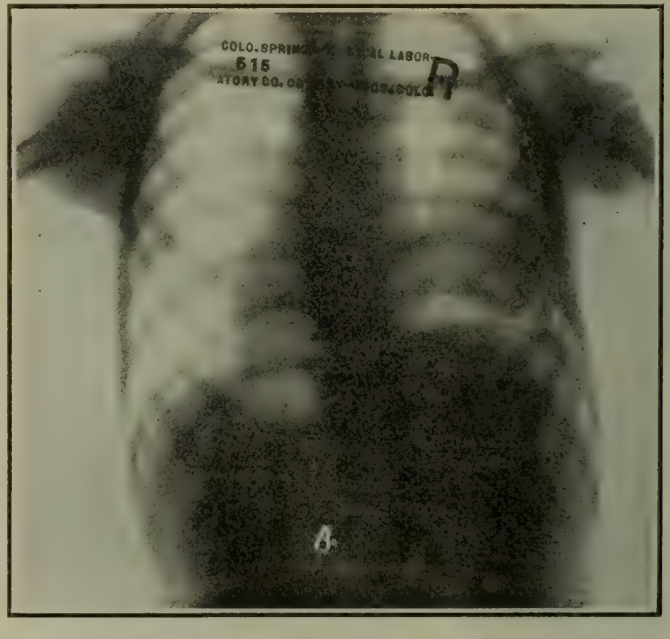

Fig. 5-B, Case 9 (Master H. K.). Localized area of increased density from the clavicle to the base, extending from the pericardium shadow to the lateral periphery. Diagnosis: Lung abscess.

I wish to mention that I cannot agree with those who say that simple thoracotomy never cures lung abscesses. I feel my experience has been sufficient to warrant my saying it does cure, pro-

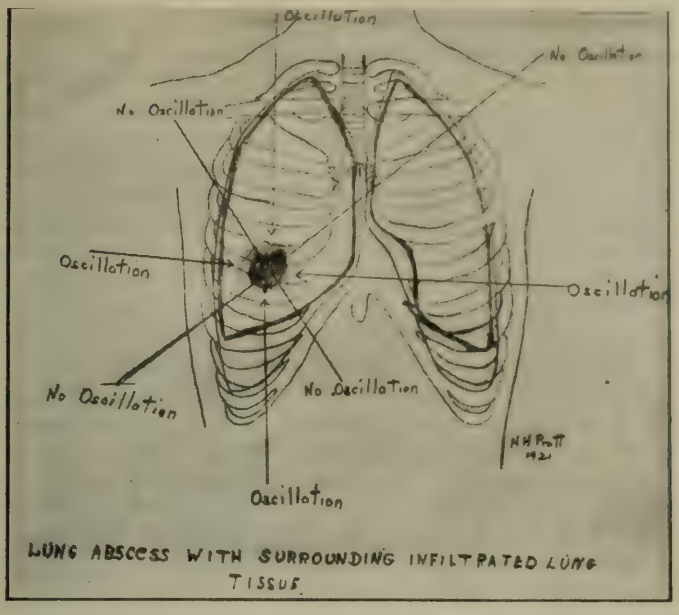

Fig. 6. Diagrammatic sketch showing site of supposed abscess. The arrows indicate areas of oscillation and no oscillation.

vided proliferation of connective tissue has not taken place and bronchiectasis is not present.

In cases where thoracotomy is not advisable, lobectomy, or at least excision

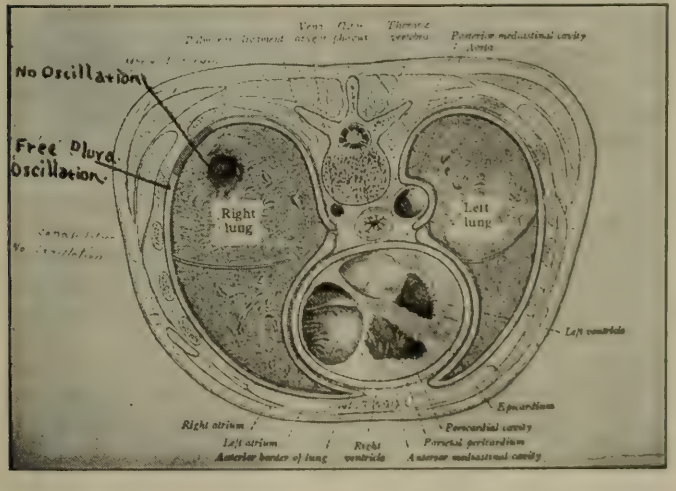

Fig. 7. Diagrammatic cross section showing site of supposed lung abscess. Needle, if introduced directly into abscess, shows no oscillation in the monometer, since the pleurae are here supposedly adherent. Laterally free oscillation is secured.

of a portion of the lobe, appears to be the operation of choice. Only complete resection of the affected part can be of any avail. Extensive rib resection may aid, but where the infected area has become hardened by proliferation of the connective tissue I do not feel that it is the operation of choice. The high mortality attending lobectomy even in the most experienced hands makes one hesitate to recommend it.

I wish now to show a few slides and two pathological specimens to illustrate a few of the points mentioned above.

In all of the cases shown every possible measure has been taken to rule out tuberculosis; so we feel that in this series tuberculosis has been excluded.

Case I.—Mrs. C. M., age 30, was seen first on November 6, 1920. She gave a history of frequent colds with occasional fever and cough during the previous three years. Cough and expectoration were much more marked during the preceding seven months. She had lost ten pounds in weight and was expectorating two ounces of muco-purulent, but not foul-smelling, sputum in twenty-four hours.

Examination showed coarse, moist rales at the base of the right lung, with moderate dullness.

Treatment with autogenous vaccine and postural drainage and complete rest in an institution were without benefit. Artificial pneumothorax was instituted three months after her coming under observation and has been continued up to the present time.

There is now no cough or expectoration. There seems to be complete symptomatic recovery.

Case II.—Miss F. K., a young woman of 24, had had a mild, chronic bilateral purulent infection of the lungs for approximately eight years. All methods of treatment had been but partially successful. She had had frequent small hemorrhages, but had been able to follow her occupation of stenographer quite regularly.

This slide is shown to demonstrate that diffuse, chronic infections may continue for many years without bronchiectasis, marked physical or x-ray signs, or marked impairment of health.

Case III.—Mr. J. W., age 26, was seen first on October 1, 1912. He was then observed for a period of two years following that, during which time the amount of expectoration constantly increased, and the ordinary methods of treatment, including rest in an institution, were without beneficial result.

Examination showed many moist rales at the base of the right lung with slight dullness.

Artificial pneumothorax was begun on July 15, 1914, and was continued for fifteen months, at which time the lung was allowed to expand.

He has remained well up to the present time. There is now no cough or expectoration and he follows his usual occupation.

Case IV.—Mr. F. R., age 50, was seen first on May 19, 1919. He had had tonsillectomy under general anesthesia eight months previously. Two weeks later he had had a diagnosis of influenza from which he had never recovered. Cough was continuous with recurrent attacks of

fever. He had a diagnosis of empyema and was operated upon unsuccessfully in January, 1918.

Physical examination showed definite dullness in the left lung near the root. X-ray showed consolidation in the region of the root, in which there were several cavities.

Diagnosis of lung abscess was made.

Rib resection and simple drainage by Dr. L. H. McKinnie, of Colorado Springs, with complete cessation of cough and expectoration. Slight induration and bronchiectasis had taken place in this case, but not sufficient to preclude recovery by thoracotomy.

Case V.—Mrs. A. P., age 24, was seen on May 21, 1920. She had had a tonsillectomy under general anesthesia fifteen months previously. Three days afterward she became very ill. A diagnosis of pneumonia was made and soon after she spat up large quantities of bad-tasting sputum. She lost considerable weight and fever continued high for some months. She improved, but eight months after the first attack she again became ill and large quantities of pus were expectorated.

Examination showed involvement of the entire right lung, with marked pectoriloquy over the second and third interspace anteriorly.

The patient's general condition did not warrant extensive operation and artificial pneumothorax was suggested and carried out as the only feasible resort.

The patient improved for a time under this treatment, but later there was evidence of purulent fluid in the right pleural cavity, due to rupture of the abscess with resulting empyema. This was drained under local anesthesia. Her general condition improved markedly and the wound was allowed to close.

Some months later her temperature again rose and a definitely localized abscess was noted in the second interspace anteriorly. This was again drained by trochar and catheter. The patient still wears a small drainage tube, although the lung has apparently cleared up. Expectoration is slight and her general condition excellent.

Case VI.—Master P. M., age four and a half years, was first seen on September 11, 1920. Eighteen months previously he had had a sudden attack during the night of what was thought to be croup. Has coughed since that time. Tonsillectomy was performed later with no improvement in cough or expectoration.

Examination showed a definite dullness in the right axillary line with a small area of pectoriloquy. This boy was bronchoscoped on several occasions by Dr. T. E. Carmody, of Denver, and on one occasion it was thought that small pieces of chewing gum were secured. He was given postural drainage and autogenous vaccines with little beneficial result.

External operation was suggested, with probably lobectomy, but sufficient hope of recovery could not be held out to warrant urging so radical a procedure.

Case VII.—Miss G., age 60, a superintendent of nurses, was first seen in January, 1920. Fifteen months previously she had had three teeth extracted under general anesthesia. Immediately following the extraction the patient complained of severe pain in the chest and one week later she developed what was diagnosed as influenza followed by pneumonia. After three months' treatment the left lung failed to clear and the x-ray showed a shadow in the lower lobe. She went to Florida for the winter, but failed to gain. She had a diagnosis of empyema and was advised to have immediate operation. This the patient did not submit to and returned to Chicago. She was given autogenous vaccine and postural drainage without relief. One year after her trouble began she expectorated a molar tooth and nine ounces of thick pus at the same time. She improved for a time following that, but it did not continue. She came to Colorado Springs fifteen months after the illness had begun.

Examination showed a marked, well defined dullness at the base of the left lung, with bronchial breathing and many coarse rales.

A diagnosis was made of chronic lung abscess, following the inhalation of a foreign body.

On February 2, 1920, she had a rib resection by Dr. L. H. McKinnie and drainage attempted. This was not satisfactory and but little improvement following the operation.

Four months later a second attempt was made with resection of two more ribs. Drainage was better following the second operation, but the patient died some weeks later with signs of a septic meningitis.

The post-mortem examination showed the characteristic pathology of chronic lung abscesses. The bronchial walls were thickened and the bronchi dilated. Lobectomy in this case should have been attempted, as the pathology present showed that it was not suitable for artificial pneumothorax or thoracotomy.

Case VIII.—Mr. J. H., age 51, a chronic asthmatic, was taken acutely ill on January 13, 1920, and was diagnosed pneumonia, from which condition he did not completely recover. Two months later his condition was diagnosed lung abscess following pneumonia, with beginning empyema.

Exploratory puncture over the abscess area showed a fully adherent pleura. Both the empyema and abscess were drained under local anesthesia. Complete recovery followed.

Case IX.—Master H. K., age 6 years, in August, 1920, had had tonsillectomy under general anesthesia. Seventeen days later he complained of severe abdominal pain, for which an appendectomy was performed. The patient did not rapidly recover and a few days later he expectorated a large amount of foul-smelling pus. Expectoration ceased after some weeks, but the fever continued, with impairment of breath sounds in the right chest.

Exploratory puncture was done under a general anesthesia, but no pus was secured.

The first slide shows the condition of the patient at that time. Two x-ray pictures were taken, which revealed a definite lung abscess. The adherent area over the abscess was outlined

by the use of the artificial pneumothorax machine and the case was operated upon by Dr. C. F. Stough, with rib resection and simple drainage.

At the present time the patient is recovering satisfactorily. The fever has disappeared, although the wound is still draining.

I mention this case to show the extreme chronicity of lung abscess following tonsillectomy.

Case X.—Miss E. J. was seen first on September 4, 1917. Eighteen months previously she had had a tonsillectomy under general anesthesia. She remained in the hospital two days. Some months later she had a high temperature and a diagnosis of pneumonia was made. This subsided in four weeks, leaving no marked expectoration, but some trouble in the right chest. During the ensuing summer she felt well, but seven months after the tonsillectomy she again had fever which lasted for four weeks. Two months later she had a third attack. About eleven months after the tonsillectomy she suddenly expectorated large quantities of foul-smelling sputum. The sputum continued although the quantity decreased to some extent. At the time she came under observation she was expectorating from six to ten ounces of a muco-purulent sputum in twenty-four hours.

Examination showed marked dullness at the right base anteriorly, with many moist rales and no pectoriloquy. X-ray showed a definite circumscribed shadow at that point.

Artificial pneumothorax was begun and was continued for one month, with little improvement in cough, expectoration or other symptoms.

In October, 1917, drainage was attempted at the point where we felt the lung was most adherent to the chest wall, this point having been determined by the artificial pneumothorax machine. Drainage was only partially successful at that time, but a few days later satisfactory drainage was secured, which led to immediate relief of all symptoms. Due to the fact that hair was found in the discharge after operation, we feel that the final diagnosis would be that of a dermoid cyst, but I place it in my series as the symptoms did not appear until after tonsillectomy. The method of localizing by the artificial pneumothorax machine was extremely applicable here.

The patient has recovered completely, and has remained well. She recently successfully underwent an operation under general anesthesia for sub-acute appendicitis, with no unfavorable results.

Case XI.—Mr. E. P., age 54, entered the Union Printers' Home in August, 1918. Some months prior to his admission he began to have cough and pain in the right chest and expectorated foul-smelling sputum.

Examination showed marked dullness with coarse rales at the apex of the right lung.

X-ray showed intense clouding at the apex on the right, down to, and including, the fourth interspace. On account of repeated hemorrhages artificial pneumothorax was begun and continued for four months. At this time the patient became markedly more septic, with evidence of fluid in the right pleural cavity. This was aspirated on several occasions, being very foul-smelling. The pacient died on January 29, 1919.

Post-mortem examination revealed an ulcerative and destructive lesion at the extreme right apex. The walls of the bronchi were much thickened and the bronchi were dilated. Pyopneumothorax was present on the right due to rupture of the abscess into the pleura.

This case shows the futility of artificial pneumothorax where the abscess is indurated or decidedly adherent. In this case also lobectomy would have been the only operation advisable.

Case XII.—This patient, an adult male, entered the Union Printers' Home in February, 1921. One year previously he had had a diagnosis of pneumonia and was in bed for seven weeks. He had had high fever, marked cough and profuse expectoration. At the time of his admission his general condition was extremely bad. Edema was general; there was much shortness of breath and there was an expectoration of from four to six ounces of foul-smelling sputum in twenty-four hours.

Examination showed definite dullness with an area of marked pectoriloquy at the base of the left lung, posteriorly.

The patient died March 12, 1921, about six weeks after his admission.

Post-mortem examination showed a chronic abscess at the base of the left lung with pus kidney on the left.

In this case also thoracotomy or artificial pneumothorax would evidently have been of no avail, and the patient's general condition did not warrant consideration of lobectomy.

SUMMARY

From 6 to 33 per cent of all cases of lung abscess recover spontaneously.

If spontaneous recovery does not occur within eight weeks some type of operative procedure should be considered.

The type of operation to be advised depends upon the location of the abscess and the pathology present.

Bronchoscopy, artificial pneumothorax, thoracotomy, extensive rib resections and lobectomy are of value, and should be employed in suitable cases.

The artificial pneumothorax apparatus affords a simple and reliable method of determining the presence or absence of pleural adhesions, and over how large an area these adhesions extend.

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DISCUSSION—SYMPOSIUM ON LUNG ABSCESS

Papers of Dr. Lyman, Dr. Minor and Dr. Giese.

(Only a part of the discussion of this Symposium is printed herewith. In a disastrous fire at the printing plant handling the Journal the manuscripts of this Symposium were burned. It has not been possible to duplicate all the discussions.)

Dr. Louis Hamman, Baltimore, Md.—I do not consider the diagnosis of pulmonary abscess especially difficult. Occasionally an instance of the condition will for a time cause perplexity, but as a rule the history of the illness and the character of the sputum make the diagnosis easy.

Perhaps the question of greatest practical importance is the treatment. From 40 to 50 per cent of lung abscesses heal spontaneously. That is of primary lung abscesses, not those secondary to some other disease. Those that do not heal pass gradually into a chronic stage. In the early stage drainage of the abscess and gradual sterilization usually lead promptly to healing. If the abscess is not operated upon and fails to heal spontaneously at the end of three or four months, it becomes encased in a firm, dense fibrous capsule. There is then no longer any chance for the abscess to heal spontaneously nor will simple drainage lead to a cure. The patient must face either a formidable surgical procedure or a life of chronic invalidism with the disagreeable symptoms characteristic of a chronic abscess, subject to the serious hazards this condition entails. Therefore, while the advantages of early operation are quite clear, still we hesitate to advise operation at once because nearly half of the patients recover spontaneously and we have no methods by which to determine in the early stage which will recover and which will go on to the chronic stage. Thus the situation proposes one of the nicest points a physician must decide. I consider it important that from the moment the diagnosis is made the physician and surgeon should together study and follow the patient and decide upon the proper time for operation. Having in mind the dreadful state of patients with chronic lung abscess, I should for my own self choose early operation rather than wait for a spontaneous cure that might not arrive.

Dr. Homer Dupuy, New Orleans, La.—Tonsillectomy unquestionably contributes its share in the causation of lung abscess. Most of the authorities admit that such abscesses are due to inspiration of blood which carries along with it caseous material and debris from the tonsil.

The type of operation has much to do in adding danger from this source. I am not advocating any specific type of operation, whether it be by dissection or by use of the Beck or allied methods. I believe that the chief point is to minimize the possibility of blood and other material's reaching the lower respiratory tract. The proper use of a suction apparatus, that is, it should be so applied that it is sucking up blood and secretions which are trickling down at the base of the tongue, greatly reduces this danger. Sponging off the debris which oozes from the tonsillar crypts during a tonsillectomy will certainly reduce the danger of infecting the lower respiratory apparatus.

I recall two cases of post-tonsillectomy lung abscess at Charity Hospital at a time when we had not begun the use of the suction apparatus. Since using that apparatus in hospital and in private practice covering a period of ten years, I have not seen a lung abscess from tonsillectomy. The rare occurrence of such abscesses in New Orleans is largely due to the proper, and I insist upon the proper, use of the suction.

Dr. Giese (closing).—I have tried to bring out in my part of the Symposium that the treatment of lung abscess is an individual one, and is different for the individual case. A few, presenting the condition of rather generalized infections where bronchiectasis has not taken place, will do well under compression. Some do well under drainage and there are some who can only be benefited by lobectomy.

The method of localizing a point where adhesions between the layers of pleurae has taken place I have found to be of considerable help to the surgeon. It is easy of application and can be carried out by any one familiar with artificial pneumothorax procedure.

Dr. Lyman (closing).—Nearly all of the reported cases of lung abscess have occurred in adults.

The explanation advanced to account for the fact that nearly all cases of lung abscess occurred when ether was used as the anesthetic and that none could be found in cases where nitrous oxid was used, was that these cases are nearly always due, in the opinion of the author, to inspiration of infective material, and that when ether is used it is not unusual for the anesthesia to be deep enough to abolish the cough reflex, while this protective reflex is not affected in nitrous oxid anesthesia.

CHOKED DISCS FROM PERISINUS ABSCESS: SINUS NORMAL

By J. H. Buckley, M.D.,
Fort Smith, Ark.

The following case is reported because of its rarity. Just how rare, I did not realize until I was asked to prepare a paper for the Sebastian County (Arkansas) Medical Society. My intention was to report this case and the bibliography and some abstracts of other papers read. I asked the American Institute of Medicine to furnish a bibliography from all languages from the beginning to date, and to let me have a few abstracts upon the subject. Under date of February 18, 1922, the Institute wrote me:

"We have searched the literature diligently. The only information that we can report to you is the enclosed material, but we doubt very much that this will be of any great value to you. We

believe that you have a rare condition and that it should be reported."

As a matter of fact, they could find no such case reported, and while this fact cuts my paper short, it makes the report of my case of somewhat greater interest.

Mrs. T. L. P., a housewife.

Her father living and a rheumatic. Her mother also living and in fair health. No living brothers, but two were dead. One died at premature birth and the other at eighteen months of age of "brain fever." There were no sisters living or dead.

She had never miscarried.

As to previous illness, she gave a history of having had malaria, "bilious attacks," pneumonia, whooping cough, tonsillitis and la grippe.

She came to my office on April 21, 1921, saying that on about January 8, 1921, she had developed earache on the right side. In a few days the ear began running, and about that time the left ear began to ache. In two or three days the left ear began running. The left ear discharged for six weeks and then stopped. The right ear had never stopped.

The tenderness behind the right ear began about the 15th of January. Pressure upon the tip of the right mastoid at the time she came to see me first, caused very little pain. The same thing was true when pressure was made upon the mastoid antrum. Quite a deal of pain, however, was caused by pressure in the region of the mastoid emissary vein.

Some time in March pain developed in the right parietal region. That pain became more severe upon pressure in that region.

Her eyes began to trouble her about April 14, about one week before she first consulted me. At times double vision was present; the right rectus muscle moved slowly; and the right eye could not be rotated to the right quite so far as could the left. The pupils responded to light and to accommodation. Vision in each eye was 20/20.

The ophthalmoscope showed choked discs of about four and one-half dioptres. The left seemed a little more swelled than the right.

Temperature was 98; pulse, 80; and respirations, 20.

X-ray threw no light on the condition of the brain.

Urinalysis: color, amber; reaction, acid; specific gravity, 1020; sugar, negative; albumin, negative; leucocytes, few in number; epithelial cells of flat variety fairly numerous; and no casts.

Blood examination: polymorphonuclears, 66 per cent; small mononuclears, 10 per cent; large mononuclears, 4 per cent; transitionals, 20 per cent; and eosinophiles, 2 per cent.

I made a diagnosis of mastoiditis and brain abscess.

We performed a mastoid operation and exposed the lateral sinus and uncovered it about an inch and a quarter long and three-fourths of an inch wide. There was a perisinus abscess, which we drained. I estimate that there escaped a dram and a half or maybe two drams of thick, yellowish pus. Lying upon the sinus was a mass of thick greenish necrotic material. The sinus seemed perfectly healthy.

My colleagues in the case said that they believed we had found and removed enough cause to have produced the symptoms and suggested that I dress the wound and perform another operation later if necessary. I thought that the cranium should be opened, but I acquiesced and acted upon their advice.

On May 1 she left the hospital, going home for a little visit. The discs had receded to 2½ dioptres elevation.

One week later she returned and the discs were 1½ dioptres swollen. The last time I saw her was about three months after I had operated upon her, and at that time the discs seemed quite normal and vision in each eye was 15/15.

Southern Medical Journal

JOURNAL OF THE
SOUTHERN MEDICAL ASSOCIATION

Published monthly by the Southern Medical Association, Empire Building, Birmingham, Alabama. Annual subscription $3.00. Single copies 25c each.

Entered as second-class matter at the Postoffice at Birmingham, Alabama, under Act of March 3, 1879 Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized December 20, 1921.

DR. M. Y. DABNEY, Editor
C. P. LORANZ, Secretary-Manager

Vol. XV SEPTEMBER 1922 No. 9

EDITORIAL DEPARTMENT

SOUTHERN MEDICAL ASSOCIATION
Sixteenth Annual Meeting, Chattanooga, Tennessee, November 13-16, 1922

EXAMINATION OF THE SPINAL FLUID IN EARLY SYPHILIS

Until recently it was thought that infection of the central nervous system was one of the late manifestations of syphilis, and concurrently it was supposed that changes in the spinal fluid did not take place early in the disease.

The recent work of Keidel and Moore[1] has proven that changes are to be found in the spinal fluid in pratically every instance during the early months of the disease in the cases in which neurosyphilis develops at a later period.

This view is most reasonable, for during the secondary period, especially during the eruptive stage when the spirochetes are numerous in the tissues, it is natural to suppose that they are more numerous in the blood than at any other time; and if the nervous system is subject to infection it takes place at this period. Whether or not there are manifestations of infection depends upon the efficacy of treatment and the resistance of the patient.

1. Keidel, A. and Moore, J. E.: Studies in Asymptomatic Syphilis, Arch. Neur. and Psych., Vol. VI, 1921.

The theory explaining neurorecurrences put forth by Erlich has met with universal acceptance. His theory is that sterilization is incomplete, and, due to the therapeutic interference, the host has failed to develop resistance against the invading organisms which survive in different parts of the body. These organisms in isolated groups develop; and if they happen to be situated in the nervous system a neurorecurrence is the result.

Zimmermann[2] says:

"Erlich's explanation is supported by two facts: In the first place neurorecurrences are limited with few exceptions to patients with primary or early secondary syphilis, a period in the disease when sprirochetes are especially accessible to arsphenamin. Second, the serology of neurorecurrences is in accord with such a conception. It is striking that in this series of the thirty-two patients on whom a Wassermann test was performed a relatively short time after the appearance of nervous symptoms the result was negative in twenty-two."

A negative Wassermann test in the presence of neurosyphilis when the blood only is examined means very little and may really confuse one in attempting to make a diagnosis. The defensive mechanism of the body must be stimulated by the presence of numerous spirochetes and a generalized infection before the Wassermann test becomes positive, and this does not take place in isolated foci of the nervous system.

Moore[3] places the spinal fluid changes in three groups as follows:

(1) Those in which a slight pleocytosis and a slight increase in the globulin content is present.

(2) Those in which there is a marked pleocytosis, cells between 10 and 100 with a greater globulin content than is found in group one.

(3) Those in which the pleocytosis is

2. Zimmermann, Ernest L.: Neurorecurrences Following Treatment with Arsphenamin, Arch. Derm. and Syph., Vol. V, No. 6, June, 1922.

3. Moore, Joseph Earl: Studies in Asymptomatic Syphilis. Bulletin Johns Hopkins Hospital, Vol. XXXIII, No. 77, July, 1922.

marked, together with a great increase in the globulin content and a positive Wassermann reaction with a small amount of spinal fluid, 0.2 c. c. or less.

The necessity of an early examination of the spinal fluid is thus brought very forcibly to our attention; and the fact that we are doing our patients an injustice when we dismiss them as well without first examining the spinal fluid, is made apparent. Every patient at the end of the period of probation should have a spinal fluid examination and this examination should consist of a cell count, with an examination for globulin and a Wassermann test in which not only the smaller amounts but up to 2 c. c. of fluid are used.

In the event that the fluid is positive and the patient does not respond to the regular treatment, it is advisable to combine some form of intraspinous therapy with the other therapeutic measures employed.

THE PHYSIOLOGY OF PHYSICAL EXERCISES

The law that activity means life, and rest decay, applies to the bodies of human beings as it does throughout all Nature. Use develops a muscle while non-use results in atrophy. Regular, systematic exercises with the idea of bringing into play every important group of voluntary muscles, and every joint and ligament, in the body should be as much a part of the daily routine of life as the three meals a day.

If it be true that one-third of the blood of the body at rest is in the muscles, and two-thirds in the internal organs, while during physical exercises two-thirds of the blood is in the muscles, it will be readily understood that if one does not take exercise the internal organs will suffer from passive congestion, and that the fleshy tissues of the body will atrophy and become stiff and painful from receiving too little nourishment. There can be no question that this lack of exercise is one of the causes of the pains in the back, muscles and joints of people past middle life, the so-called infirmities of old age.

Exercise eliminates toxins through oxidation as is evidenced by deep and rapid breathing with the resulting increase of the intake of oxygen and a greater output of carbon dioxid by exhalation through the lungs. Exercise also eliminates toxins through perspiration, thus relieving the work of the liver and kidneys. If one will learn the physiology of exercise one will see the necessity for using the muscles enough each day to produce profuse perspiration. After such exercise it is important to take a full bath, followed by brisk rubbing of the skin with a coarse towel to keep open the sweat glands.

The groups of muscles that are least used and which play an important part in promoting health are those of the abdomen. There can be no doubt that many of the functional digestive and nervous diseases with which so many people suffer are brought on by the fact that their abdominal muscles are not used and have not been developed. This is particularly true of women who wear corsets which prevent their using their abdominal muscles.

X-ray observations have disclosed that with relaxed abdominal walls the stomach and intestines show very slight peristalsis, but when the abdominal muscles are contracted, the stomach and intestines become hypertonic. The habitually relaxed abdominal muscles of the person who takes no regular physical exercise, with the consequently lowered intra-abdominal pressure, result in passive congestion of the internal organs and atony of the muscles of the stomach and intestines. The prevention and cure of many functional digestive and nervous troubles depend upon regular and systematic exercises that develop and strengthen the in-

ternal and external oblique and recti muscles, and which at the same time reduce the venous congestion of the abdominal viscera. Whatever kind of exercises one takes, particular attention should be paid to the exercises of the abdominal muscles.

DAILY EXERCISES POSTPONE OLD AGE

Daily exercises not only increase efficiency the day they are taken; they postpone senility by keeping the arteries resilient. One of the effects of exercise is to increase the rate and strength of the heart's action, thus dilating the arteries, arterioles, capillaries and veins. This exercise of the entire circulatory system surely prevents the arterio-capillary fibrosis that is the essential factor in old age.

The character and the amount of daily exercise that one needs depend much upon the character of one's work. Thus, the farmer, the mechanic or the day laborer gets sufficient, and sometimes too much exercise. In some of the occupations that require the constant bending forward of the body one should take regular exercises of the opposite groups of muscles to prevent becoming stoop-shouldered.

Since the advent of the automobile few physicians secure enough exercise except of the arm and leg muscles. In order to keep physically as well as mentally fit for their really arduous duties, physicians should take daily exercises of the groups of muscles which are not used in driving automobiles.

There can be no question of the therapeutic value of physical exercise and it is to be regretted that physicians generally are remiss in their duty to prescribe appropriate exercises to their patients. The physical culture "specialists," who usually are alike ignorant of anatomy, physiology and pathology, are treating many patients who should be in the hands of physicians. Sometimes physical directors make remarkable cures of men and women who have tried to work with flabby muscles. One such cure is heralded abroad and patrons flock to them. Many of these physical directors also prescribe the diet and in other ways regulate the lives of their patrons, sometimes in the most absurd way.

That the public is alive to the importance of physical training is shown by the fact that several so-called physical culture magazines have large circulations. Some of them are in the2 hands of the chiropractors, the antivivisectionists and other quacks and cults who are boldly attacking the medical profession. The public is being impressed by this pseudo-scientific material that it is reading, because it is attracted to physical culture, which is something that most men and women feel that they need. It is high time that the medical profession is awakening to the public demand for rationally prescribed physical training. Every physician should be as well prepared to advise his patients about the exercise suited to their needs as he is regarding diet in health and in various diseases.

THE SIXTEENTH BIRTHDAY OF THE SOUTHERN MEDICAL ASSOCIATION

Sixteen years ago, in 1906, the Southern Medical Association was born in Chattanooga. It was an accouchement of so much imortance that doctors from six states were called in consultation to see that the baby was properly born. Neither chloroform nor "twilight sleep" were used to decrease the pains of parturition, though the mother association, the Tri-State Medical Society of Georgia, Alabama and Tennessee, gave up her life in bringing into being an infant that has had a phenomenal growth.

The infant prodigy among medical associations was tenderly cared for and was properly nourished by the physicians from six states for five years, when it outgrew its swaddling clothes and the medical profession of the sixteen Southern states was called upon to adopt the Southern Medical Association. It seemed that the time was propitious for the growth and development of the young medical giant because the leading Southern physicians in all lines of work, nearly 7,000 at this time, have vied with each other in their interest in the upbuilding of a great medical association in the South.

The Chattanooga physicians have been among the most ardent supporters of the Southern Medical Association throughout all the years of its existence; and now that it is full grown, being the second largest medical association in the United States, and "the most independent on earth," it seems fitting that the members of this great medical organization should make a pilgrimage to the city of its birth.

Many changes have taken place in Chattanooga since the Southern Medical Association was born. New and great hotels have sprung into existence and other improvements have been made, so that the beautiful city that lies at the foot of battle-scarred Lookout Mountain seems to have been preparing to entertain the 2000 or more physicians who will gather there November 13-16 to add another chapter to the history of American medicine.

Since Chattanooga and its environs, Lookout Mountain, Missionary Ridge and Chickamauga, was the storm center of the last year of the Civil War, and since Camp Greenleaf, the great medical training school in the World War, where doctors were taught how to pick up cigar stumps and make up beds, was located near Chattanooga, there is much of historic interest for the physicians and their wives who will attend the November meeting of the Southern Medical Association. Indications point to a record attendance, and the Chattanooga physicians assert that all who go will have satisfactory hotel accommodations.

The Chairman of the Hotel Committee, Dr. J. H. Revington, suggests that doctors get together in their towns, plan to go together and room together, and make their reservations for these parties of two, three and four. In that way all can be taken care of nicely.

Special, round trip, reduced fares have been granted on all railroads on the certificate plan, just as last year. Each member of the Association will receive a certificate in due time without making application for it. Doctors who are not members and who wish to attend will have to ask the Association office for a certificate in order to get the benefit of the reduced rates.

Correspondence

TREATMENT OF LEUCOPLAKIA AND EARLY LESIONS OF THE TONGUE

Editor, SOUTHERN MEDICAL JOURNAL:

Leucoplakia.—The cause of leucoplakia is tobacco, as a rule associated with dirty teeth. It makes no difference in what form the tobacco is used. Syphilis is not a cause of leucoplakia. It, however, may exaggerate the condition—Wassermann plus has been present in about 7 per cent of my cases.

The treatment for leucoplakia is to remove the cause and to clean the teeth. I now have more than 100 cases relieved by this treatment only.

If the Wassermann is plus of course give specific tratment.

In every case look for the organism of Vincent's angina. I have never observed this, except when, in addition to the white patches of leucoplakia, there have been definite red areas, like erysipelas. There was such a case in the office this morning.

The treatment for Vincent's angina is: Touch the red areas and the pockets about the teeth with sodium perborate. Make a paste of the powder and rub it on the area with cotton. The patient should be given a gargle of perborate to be used two to three times a day, one teaspoonful to a tumbler of water. Continue this treatment

until the organism disappears from the cover slips. Be careful not to push the treatment too hard, as it produces a general stomatitis.

Leucoplakia, in my opinion, should never be touched with any caustic or x-ray; and radium is not necessary. Tobacco in all forms must be absolutely discontinued.

When a patch of leucoplakia scales and leaves an ulcer, the area should be cut out with the electric cautery with a good margin of healthy mucous membrane and deep tissue, as cancer may develop in such an area.

Early Lesions of the Tongue.—Any localized area on the tongue—a wart, ulcer, or induration, should be excised at once. Use novocaine, excise the area with a good margin sufficient for cancer. Use the electric cautery. Obtain a piece for microscopic diagnosis. Close with fine silver wire, leading the wires out of the mouth. Never merely cut out a piece for diagnosis.

When a piece of the tongue is excised, always remove enough so that if the microscope shows cancer no more need be done.

Jos. C. Bloodgood, M.D.
804 N. Charles St.,
Baltimore, Md., July 27, 1922.

A RESOLUTION

Editor, Southern Medical Journal:

If possible kindly insert the following in your Journal: L. H. Webb, M.O.R.C., Secretary.

New Orleans, La., July 26, 1922.

We, the Medical, Dental, Veterinary, Medical Administrative Officers of the Medical Department Reserve Corps, U. S. Army of the Fourth Corps Area, on active duty at Camp McClellan, Alabama, July 12 to 26, 1922, for the purpose of field training, being in meeting assembled and desiring to express our appreciation for the training and courtesy shown, hereby resolve:

(1) That we tender to the Surgeon-General and subordinates, to the Commandant Organized Reserve Corps Camp McClellan and subordinates, particularly the Camp Surgeon and his staff of trained instructors, our sincere appreciation and thanks for the competent manner in which the technical instruction was given and courtesies shown.

(2) That we go on record as endorsing this plan of training for medical officers and hope that steps will be taken to procure the necessary funds to extend training in the future to a larger number.

(3) That we are unanimously opposed to the initial appointment of officers in the Medical Reserve Corps above the grade of First Lieutenant, who were not on active duty during the World War.

(4) That we further oppose any policy that places restrictions such as age, etc., or attendance at camp and any other restrictions of medical officers' promotions which are not placed on promotions of Reserve officers in the line. Attention is respectfully invited to the fact that medical officers are in civilian life practicing every day their branches, and those officers of the non-technical branches are not practicing the form of duty upon which they will be called to function in time of war.

(5) That copies of these resolutions be submitted to the Surgeon General (through camp surgeon) and camp commandant, Camp McClellan, Alabama, also that copies be furnished the Journal of the American Medical Association, Southern Medical Journal, The Military Surgeon, American Hospital Journal, American Pharmaceutical Journal, National Dental Journal, Military Dental Journal and American Veterinary Journal.

L. H. WEBB, Major, M. O. R. C., Secretary,
New Orleans, La.
F. M. HARBIN, Major, M. O. R. S.,
Columbia, S. C.
F. M. BOYETTE, Captain, M. O. R. C.,
Oneida, Tenn.
L. H. BREVARD, 1st Lieut., M. O. R. C.,
Hernando, Miss.

Book Reviews

Clinical Tuberculosis. By Francis M. Pottenger, A.M., M.D., LL. D., Monrovia, Cal. Second Edition. In two volumes totaling 1330 pages. St. Louis: C. V. Mosby Co., 1922.

In the preface to this voluminous work the author writes that it is rather encyclopedic in scope and deals with the subject in a manner, and from an angle, which has not been employed by other writers. The reviewer entirely agress with the author in this statement, but remains at a loss for a place to which this new effort may properly be assigned among the already oppressively great number of books on tuberculosis.

It is not a text book, for its size and the peculiar views of its author would make one hesitate to recommend it to the medical student. It is not a reference work, for in it very little attention is paid to the views and opinions of others. Also, it is not an encyclopedia of present knowledge and theories concerning tuberculous infection, for the author has largely confined his statements of facts and theories to those that he has developed in his own work.

To the trained and experienced worker in tuberculosis Dr. Pottenger's books will prove interesting in that they show the mental reaction of a physician who has been conducting a private sanatorium for many years; and, on the other hand, numerous valuable observations based upon large experience are scattered throughout the two volumes.

One finds it difficult to understand the author's enthusiasm with reference to tuberculin; and the statement (page 352, Vol. 2), "I can conceive of few conditions where tuberculosis is present that tuberculin may not be used to advantage, if any other therapeutic measure may be used advantageously," causes something of a shock despite the excellent, but unconvincing, charts accompanying the chapter on the use of tuberculin.

A reduction in the number of pages devoted to facts and fancies regarding the vegetative nervous system would be a boon to readers of the first volume.

To mention a minor idiosyncrasy, the author persistently uses the trade name "Adrenin" to designate the active principle to which its discoverer, Professor Abel, gave the name "Epinephrin". Such errors as "humeral" for "humoral" and "Pyer" for "Peyer" are evidently typographical.

Mechanically the books are pleasing. The two volumes are printed in large, clear type on good paper, and are attractively bound.

X-Ray Dosage in Treatment and Radiography. By Wm. D. Witherbee, M.D., Radiotherapist, Presbyterian Hospital, New York; Formerly Roentgenologist, Rockefeller Institute; and John Remer, M.D., Radiotherapist, New York Hospital; Consulting Radiotherapist, United Hospital, Port Chester. 87 pages. Illustrated. New York: The Macmillan Co., 1922.

In less than a hundred pages the authors have condensed much valuable information about x-ray treatments. The directions for dosage are stated and also specific advice for particular lesions are given.

The writers' long and wide experience in roentgenology enables them to throw out numberless suggestions which will prove most helpful, as for instance the warning against treating a patient for two weeks after the use of iodin, iodoform, resorcin, oil of cade, tar preparations, lotio alba, salicylic acid, B-naphtol, chrysarobin, gasoline, benzine, scarlet red, sulphur, benzoic acid, strong mercury preparations, and balsam of Peru.

Criticisms of the little booklet are few. First, there is the misuse of the adjective tubercular for tuberculous, and, second, the absence of both a table of contents and an index. The brevity of the work can explain the latter two, and poor editing the first.

We would emphasize the fact that the book is of exceptional value and is not to be classed as a "seller."

Aid to Bacteriology. By Wm. Partridge, F.I.C., Joint Public Analyst, County of Dorset, and Borough of Poole and Penzance; Lecturer in Chemistry (Public Health), University of London, King's College. Fourth Edition. 276 pages. New York: Wm. Wood & Co., 1922. Cloth, $1.75.

This pocket size volume on bacteriology must be judged by its purpose and size. It calls itself an "aid" to the student, and may serve as a brief resume, but its length precludes all possibility of its being full enough for a text book or a reference work. However, as a compend it is good.

Symptoms of Visceral Disease. A Study of the Vegetative Nervous System in Its Relationship to Clinical Medicine. By Francis Marion Pottenger, A.M., M.D., LL.D., F.A.C.P., Medical Director, Pottenger Sanatorium for Diseases of the Lungs and Throat, Monrovia, Calif.; Author of "Clinical Tuberculosis," "Tuberculin in Diagnosis and Treatment," "Muscle Spasm and Degeneration," etc. Second Edition, 86 Text Illustrations and 10 Colored Plates. 357 pages. St. Louis: C. V. Mosby Co., 1922. Cloth, $5.50.

The book is well written and is, as the author states, an attempt to interpret in terms of visceral neurology, symptoms of every-day occurrence in clinical medicine.

It takes up the separate systems of the body and discusses the symptoms related to disfunction in them. The book is out of the ordinary in its mission, and the fact that it has already been through one edition, speaks for its usefulness.

Clinical Diagnosis. Case Examination and the Analysis of Symptoms. By Alfred Martinet, M.D., Paris, France. With the collaboration of Drs. Defosses, G. Laurens, Lion Meunier, Lutier, Saint-Cene, and Terson. Authorized English Translation from the Third Revised and Enlarged Edition by Louis T. de M. Sajous, B.S., M.D. With 895 text engravings and several full-page color plates. 1388 pages. In two Royal Octavo Volumes. Philadelphia: F. A. Davis Co., 1922. Net $7.00 per volume.

The first volume of 645 pages takes up physical and laboratory diagnosis. It includes a section on electrocardiography which is to be deplored, as the author in a foot note states that he has had no special experience in this subject.

The second volume deals with the analysis of symptoms. It seems strange that atrial flutter is not mentioned under the arrhythmias.

In the main the work is not without merit and the books will prove useful for quick reference.

Food, Health and Growth. By L. Emmett Holt, M.D., LL.D. 273 pages. New York: The Macmillan Company, 1922.

This excellent volume, by an eminent authority of normal and abnormal children, is a general discussion of the nutrition of children. The little book is a compilation of the Lane Lectures delivered by Dr. Holt at the Medical School of Leland Stanford Junior University in 1921. It contains full discussions of the nutritional requirements of children, the vitamins, proper food for school children, and practical measures of improving health of children. It is a splendidly written book that will be found useful for the parent, school teacher, or social worker, as well as the physician.

Diseases of the Stomach and Upper Alimentary Tract. By Anthony Bassler, M.D., F.A.C.P., Professor of Gastro-Enterology, New York Polyclinic Medical School and Hospital. Fifth Edition, Revised and Enlarged. 977 pages and many excellent illustrations. Philadelphia: F. A. Davis Co., 1922. Cloth, $8.00.

The phenomenal reception of four former editions will guarantee a hearty welcome for this new and revised edition. The outline of subject matter is logical, beginning with the anatomy, physiology and chemistry of the upper digestive tract, and later on giving a full discussion of the pathology of each region. Chapters on history taking and examination of the patient are worth the price of the book. Under examination of the patient, the new chemical methods and roentgenology are clearly and fully described. The section devoted to therapeutics leaves nothing to be added. The unique way of describing the diseases of the mouth, esophagus, stomach, etc., makes a very strong section designated "The Clinic." The author's purpose, as expressed in the introduction, is not to divorce gastro-intestinal diseases from the work of the internist, but to enable him to better understand these diseases.

Diseases of the Thyroid Gland. By Arthur E. Hertzler, M.D., F.A.C.S., Professor of Surgery, University of Kansas School of Medicine, Surgeon to Halstead Hospital. With a chapter on Hospital Management of Goiter Patients by Victor E. Chesky, A.B., M.D., Associate Surgeon to Halstead Hospital. 245 pages, 106 original illustrations. St. Louis: C. V. Mosby Co., 1922. Cloth, $5.00.

This new work is certain to receive a ready response from the profession, because it represents the practical observations and personal experiences of the author. It is not burdened with statistics or opinions of others, but is the result of individual study. The chapters deal with usual topics as etiology and pathogenesis; symptomatology of diseases of the thyroid gland; diagnosis of thyroid disease; prognosis in diseases of the thyroid; hospital management of thyroid patients; treatment of diseases of thyroid gland; and technic of operations of the thyroid gland. The operative procedures are clearly described and the illustrations are original.

Endocrine Glands and the Sympathetic System. By P. Lereboullet, P. Harvier, H. Carlson, A. G. Guillaume. Translated by F. Raoul Masson, M.D., New York Post-Graduate Medical School and Hospital, with the Collaboration of Daniel R. Ayres, A.B., M.D. Philadelphia: J. B. Lippincott Company.

Endocrinology is now attracting widespread interest among every branch of medicine, and the profession welcomes information that is based upon the practical application of principles recently advanced. A characteristic of this excellent work is that the methods of treatment in relieving symptoms and in curing the conditions represent the experience of these writers in France, and it gives us the point of view of men outside our country. There are chapters on general considerations of endocrine glands, the pathology of adrenals, pituitary and pineal glands, the testicles, ovaries, mammary glands. Also pathology of sympathetic system and organo therapy are considered. The entire work is concise, giving only facts that have been found true, and therefore presents endocrinology in the best light.

Applied Chemistry, an Elementary Text Book for Secondary Schools. By Fredus N. Peters, Ph.D., Instructor in Chemistry, Central High School, Kansas City, Mo., for twenty-three years; More Recently Vice-Principal; Author of "Chemistry for Nurses," etc. Illustrated. 450 pages. St. Louis: C. V. Mosby Co., 1922. Cloth, $3.50.

Dr. Peters aims to make a readable text book for young students, and writes from the vantage point of many years' teaching experience with them. The chapters are conveniently prepared with an outline at the head of each and questions at the end. It contains more material than can be covered by the average high school course, but this allows the teacher to exercise discretion in his emphasis of different subjects. It is a very satisfactory beginners' text book.

Other Books Received

The Eighteenth Amendment, and the Part Played by Organized Medicine. By Charles Taber Stout. With 211 pages. New York: Mitchell Kennerley, 1921.

The Health-Care of the Baby. A Handbook for Mothers and Nurses. By Louis Fischer, M.D., Author of "The Health-Care of the Growing Child"; "Infant Feeding in Health and Disease"; "A Text-book on Diseases of Infancy and Childhood"; Attending Physician to the Willard Parker and Riverside Hospitals; Chief Attending Pediatrist, Zion Hospital, Brooklyn; Medical Director of the Infantorium; Former Instructor in Diseases of Children, New York Post-Graduate Medical School and Hospital, etc. Thirteenth edition, completely revised, with 226 pages. New York and London: Funk & Wagnalls Co., 1921. Cloth, $1.00.

Southern Medical News

ALABAMA

Dr. James R. Garber, Birmingham, has associated with him Dr. Carlton A. Lee, formerly of Atlanta, Ga., and New York. Practice limited to obstetrics.

Dr. Carl A. Grote, Huntsville, City and County Health Officer, because of his work in lowering the death rate of that city, has been presented with a silver loving cup by a local newspaper.

The Red Mountain Sanatorium, Birmingham, established by the Antituberculosis Association of Jefferson County twelve years ago, has been closed. It is expected that a suitable structure will be erected at the county farm for tuberculous patients.

The State Board of Health is planning to use former service men, entitled to vocational training, in the fight against malaria and typhoid in the State. The men will have charge of the work of drainage, clearing mosquito breeding places, etc.

Dr. E. S. Sledge, Mobile, will succeed Dr. W. R. Jackson, deceased, as a member of the State Board of Censors, the State Board of Health and the State Medical Examining Board.

The Government has selected Florence as the location for investigations on matters of health. Dr. Lunsford D. Fricks, U. S. Public Health Service, is in charge.

Award of a contract for $313,659 for the mechanical equipment of the United States Veteran Hospital for negro disabled soldiers, Tuskegee, has been placed. The work in-

cludes the installation of a boiler plant, outside heating, electric, water and sewer services, and is to be complete by February, 1923.

Dr. D. W. Hubbard, Florence, has been elected Health Officer of Lauderdale County, succeeding Dr. W. H. Abernathy, resigned.

Dr. William Elbert Faris and Miss Martha Ann Law, both of Birmingham, were married June 30.

Deaths

Dr. John D. Jay, Pera, aged 81, died July 14 from senility.

Dr. Robert Henry Baird, Cullman, aged 56, died July 24.

ARKANSAS

The crowning feature of the joint annual meetings of the Medical Association of the Southwest and the Tri-State Society at Hot Springs National Park, Arkansas, October 16-18, will be three clinics which will be most profitable and well worth making the trip for, even if there were not other helpful scientific matters for discussion.

Dr. W. T. Wootton, of Hot Springs, Chairman of the General Committee, announces that the mornings will be given over to clinics, the afternoons to scientific papers and the evenings to get-together meetings of the various college alumni and the usual social features. The Eastman Hotel will be headquarters, registration, exhibits and sessions all held under one roof.

The clinics will be conducted by authorities of nation-wide fame and this meeting, if the plans of the Committee carry, will no doubt go down in the history of each society as its most successful meeting. The clinic subjects will be: heart and blood vessels, kidney diseases of every form, neurosyphilis, arthritis and all forms of joint infections.

Dr. St. Cloud Cooper, of Fort Smith, Ark., is President of the Medical Association of the Southwest and Dr. Charles A. Smith, of Texarkana, Ark., is President of the Tri-State Society.

Miss Zelia Burke, Rogers, has been appointed Executive Secretary of the Washington County Health Association, with headquarters at Fayetteville.

The St. Bernard Hospital Annex, a frame structure, Jonesboro, has been torn down and a brick structure will be erected.

A clean-up and general sanitation campaign was begun in Harrison on July 15, with the organization of a City Board of Health. The Board is composed of Drs. D. E. Evans, J. D. Dodge, J. H. Fowler, Mr. J. E. Hughey, Mrs. Eula Merrill. Dr. Evans was elected Chairman of the Board and City Health Officer and Mrs. Merrill Secretary.

Fire destroyed the Stout Hospital, Brinkley, July 27. The loss is estimated between $13,000 and $14,000.

An ordinance appropriating $300,000 for the completion of the new City Hospital, Little Rock, was passed by the City Council.

A $50,000 hospital will be erected at Conway.

Dr. Herbert Fay Hempstead Jones and Miss Annie Marie Penick, both of Little Rock, were married June 15.

Dr. C. W. McLain, Gurdon, and Miss Joyce Dudley, Hope, were married at Hope June 24.

Deaths

Dr. Charles Newton, Floral, aged 77, died recently from cystitis.

Dr. James C. Sharp, Alma, aged 53, died July 7, after an illness of several weeks.

Dr. Hugh Thurman, Fayetteville, aged 42, died July 30.

Dr. Charles Sanford, Mena, aged 64, died recently.

DISTRICT OF COLUMBIA

Under the title of the Post-Graduate School of Neurology and Psychiatry of the District of Columbia, a school for the graduate teaching of diseases of the nervous system has been recently organized in Washington and will open formally in October. Dr. Wm. A. White, Superintendent of St. Elizabeth's Hospital, is President of the institution; Dr. Tom A. Williams, Vice-President; Dr. Daniel D. V. Stuart, Jr., Secretary-Treasurer; Dr. D. Percy Hickling, Dean of the faculty. Two courses of study, elementary and advanced, of six weeks each are to be offered, together with an elective course in special subjects.

The American Laryngological, Rhinological and Otological Society, at its recent meeting in Washington, elected Dr. Dunbar Roy, Atlanta, Ga., President; Dr. Wm. H. Haskin, New York, N. Y., Secretary; Dr. Ewing W. Day, Pittsburg, Pa., Treasurer.

The American Association of Pathologists and Bacteriologists, at its meeting in Washington, elected the following officers: Dr. Paul A. Lewis, Philadelphia, President; Dr. James Ewing, New York, Vice-President; Dr. Frank B. Mallory, Boston, Treasurer; Dr. Howard T. Karsher, Cleveland, Secretary.

The American Association of Genito-Urinary Surgeons met in Washington recently. The following officers were elected: Dr. William E. Lower, Cleveland, Ohio, President; Dr. Richard F. O'Neil, Boston, Mass., Vice-President; Dr. Henry G. Bugbee, New York, N. Y., Secretary-Treasurer.

The American Orthopedic Association recently met in Washington. The following officers were elected: Dr. Ralph R. Fitch, Rochester, N. Y., President; Dr. W. S. Baer, Baltimore, Md., President-Elect; Dr. Fred H. Albee, New York, N. Y., Vice-President; Dr. John L. Porter, Chicago, Ill., Secretary; Dr. DeForest P. Willard, Philadelphia, Secretary.

Plans are being drawn up for the new Hebrew Hospital and Home for the Aged, Washington. Buildings will cost $400,000.

The following changes in the medical faculty of the Georgetown University, Washington, have been announced: Major Joseph P. Madigan, Chair of Anatomy; Drs. Thomas E. Neill and Murray Russell, Associate Clinical Profesosrs of Surgery; Dr. Harry A. Ong, Associate Clinical Professor of Medicine.

The new addition to the Children's Hospital, Washington, will be a one-story structure of brick.

Dr. Grover C. O'Connor, Washington, and Miss Agnes Miller, Vicksburg, were married July 14.

Dr. Louis Charles Lehr, Washington, and Mrs. Eleanor Moale Hillen, Baltimore, were married July 1.

FLORIDA

The Highlands County Medical Society was recently organized at Sebring. The following officers were elected: Dr. Robert J. McMurray, Sebring, President; Dr. Joseph L. Cloud, Avon Park, Vice-President; Dr. J. H. Bogle, Sebring, Secretary-Treasurer.

The state officers under provisions of the Sheppard-Towner Act have been established in the State Board of Health Building, Jacksonville. Dr. William B. Keating, Director of the State Child Welfare Bureau, will be in charge. It is estimated that approximately $16,000 will be spent on the work.

A health conference, for the purpose of standardizing and rendering uniform state laws governing health and sanitation throughout the State, was held in Orlando July 5-6.

Col. Raymond C. Turck, State Health Officer, Jacksonville, has been awarded the distinguished service medal for services rendered during the Meuse-Argonne offensive in 1918.

Dr. Ralph N. Greene, former State Health Officer, has succeeded Dr. G. H. Wall as Superintendent of the St. Luke's Hospital, Jacksonville.

Deaths

Dr. Albert Henry King, West Palm Beach, aged 45, died at Asheville, N. C., June 30.

Dr. Milton J. Hicks, Jacksonville, aged 74, died at the home of his daughter, Atlanta, Ga., July 27.

GEORGIA

The Cheston King Sanitarium, Incorporated, Stone Mountain, has just been completed by Dr. J. Cheston King, Atlanta. The sanitarium is for rest-cure cases, nervous, and mental diseases, and post-operative cases for recuperation and can accommodate 125 cases. Dr. W. A. Gardner, formerly head of the Neurological Section of the Public Health and Veterans' Bureau for the Southeastern States, Atlanta, will be associated with Dr. King in his work.

The State Board of Health recently conducted a health institute for the teachers attending the summer session of the Fort Valley High and Industrial School, Atlanta, a colored institution. The institute was conducted in an effort to train the colored teachers in bettering health conditions in their communities.

The honorary edgree of Doctor of Science has been conferred on Dr. Lamartine G. Harman, Commerce, by the Board of Trustees of the University of Georgia.

Deaths

Dr. Daniel A. Haney, Newnan, aged 40, died August 1 on board a Southern train as he was being brought home from Atlanta.

KENTUCKY

The Meade County Medical Society has been reorganized. The following officers were elected: Dr. F. S. Clark, Battletown, President; Dr. B. R. Walker, Ikron, Vice-President; Dr. A. A. Baxter, Brandenburg, Secretary.

(Continued on page 38)

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(Continued from page 770)

Spencer County Medical Society has elected the following officers: Dr. J. F. Furnish, President; Dr. B. F. Shields, Vice-President; Dr. R. Y. Shepherd, Secretary.

Barren County Medical Society has elected the following officers: Dr. A. T. Botts, President; Dr. Clifton Richards, Vice-President; Dr. L. E. Botts, Secretary-Treasurer.

Boyle County Medical Society has elected the following officers: Dr. W. O. Hopper, President; Dr. P. C. Sanders, Vice-President; Dr. W. H. Smith, Secretary-Treasurer.

Calloway County Medical Society has elected the following officers: Dr. C. O. Gingles, President; Dr. Ben B. Keys, Vice-President; Dr. E. B. Houston, Secretary-Treasurer.

Larue County Medical Society has elected Dr. C. L. Williams, President; Dr. E. S. Smith, Vice-President; Dr. Leigh Maupin, Secretary.

Laurel County Medical Society has elected Dr. H. V. Pennington, President; Dr. G. S. Brock, Vice-President; Dr. Oscar D. Brock, Secretary-Treasurer.

Warren County Medical Society has elected the following officers: Dr. Ernest Rau, President; Dr. J. M. Adair, Vice-President; Dr. W. H. Neel, Secretary-Treasurer.

Dr. Leon L. Solomon has announced that he will give the University of Louisville $500 annually for use in the medical research laboratory of the University. The fund will be known as the Solomon Fund.

Dr. Charles B. Kobert, Director of the Bureau of Trachoma and Prevention of Blindness of the State Board of Health, started early in June on a six months' trip through western Kentucky. The conveyance used is a fully equipped hospital wagon, drawn by four mules. Free treatment will be given to all persons suffering from eye diseases. Congress has made an appropriation of $200,000 for a new trachoma hospital at Pikeville.

With the addition of Dr. W. R. Summers, Springfield, Mo., and Dr. William D. Powell, Harrodsburg, the medical staff at the Western State Hospital has been completed. Drs. Durham, House and Davis are the other members of the staff.

Miss Agnes E. Kloman, Columbus, Mo., who has been in the employ of the U. S. Veterans' Bureau as follow-up nurse, has accepted a position with the Scott County Health Department as Supervising Nurse.

A memorial fund in honor of Dr. I. N. Bloom, who died July 16, has been started by the medical staff of the Jewish Hospital, of which he was the first Dean. A free department of Urology will be established at the Hospital as a permanent tribute to Dr. Bloom.

Deaths

Dr. Isadore N. Bloom, Louisville, aged 63, died July 16 at Norways Sanitarium, Indianopolis.

Dr. Thomas Caruth Dunn, Fountain Run, aged 62, died June 8 from arteriosclerosis.

Dr. John H. Hussey, Eddyville, aged 62, died July 13 after a few days' illness from heart trouble.

Dr. William D. Seeley, Taylorsville, aged 72, died July 14 from heart trouble.

Dr. M. M. Leach, Lexington, died in New York, N. Y., July 25 from pneumonia.

LOUISIANA

The St. Luke's Private Sanitarium, New Orleans, opposite the new Texas and Pacific Railroad Station, will be ready for the reception of patients about September 20. Dr. B. F. Gallant, formerly Resident Superintendent of the Charity Hospital, and later Medical Director of the Belvedere Private Sanitarium, has been appointed Medical Director. The institution will be conducted for the care and treatment of constitutional diseases, cardio-renal and metabolic disturbances, functional neuroses, and mild nervous cases.

Dr. C. C. Bass, New Orleans, has been elected Dean of Tulane University School of Medicine.

At the annual meeting of the staff of Hotel Dieu, New Orleans, the following officers were re-elected: Dr. Homer Dupuy, President; Dr. E. H. Walet, Vice-President; Dr. H. E. Nelson, Secretary; Dr. P. B. Salatich, Recorder.

Mrs. Thomas, of New York, recently purchased a site in New Orleans for a home for worthy old people and convalescent mothers. The institution will be known as the Holmes-Thomas Home. Mrs. Thomas has set aside a trust fund of about $800,000 for the erection and endowment of the Home. Dr. Rudolph Matas and Dr. A. B. Dinwiddie, President of Tulane University, have been requested to act on the board of directors of the home fund corporation.

The Sophie L. Gumbel Training School for Girls was recently opened in New Orleans. The object of the school is to train girls who have been unusual problems at home or

(Continued on page 40)

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(Continued from page 38)

in the regular schools. Miss Helen E. Russell, Boston and New York, is Superintendent and Directress. The following are on the examination staff: Dr. Charles L. Eshleman, Internist; Drs. Henry Daspit and Walter J. Otis, Neuro-Psychiatrists; Prof. J. M. Fletcher, Psychologist.

New Orleans has on an extensive campaign against ants. The cost of ridding the city of ants will be approximately $40,000, making an average of $12.00 for each block. The United States Government entomologist has charge of the campaign.

Dr. Wilbur C. Smith, Professor of Anatomy in the College of Medicine of Tulane University, has been appointed Athletic Director of Tulane University.

The fire in the bacteriologic laboratories of the State Board of Health, New Orleans, July 8, damaged the building and equipment to the amount of $3,000.

An addition to the St. Rita Surgical Infirmary, New Orleans, is being erected, which will double the capacity of the institution.

The new Eye, Ear, Nose and Throat Hospital, New Orleans, will be constructed at a cost of $500,000. Isaac Delgado has donated $100,000; A. C. Hutchinson, $20.000; Thomy Lafon, the negro philanthropist, $6,000; Mrs. John Dibert, $50,000. Dr. Henry Dickson Burns is Surgeon-in-Chief.

The U. S. Public Health Service has announced that plague eradication work will be discontinued in New Orleans. For almost a year no trace of rat infection has been discovered. The work was carried on under the direction of Dr. Marion S. Lombard.

Dr. Marion S. Lombard, for three years directing head of the New Orleans division of the U. S. Public Health Service, has been transferred to Mobile, Ala. Dr. Charles L. Williams, epidemiologic aide to the State Board of Health, will succeed Dr. Lombard.

A radio outfit at the Lepers' Camp at Carville has been installed by the Woman's Auxiliary, Rollins Post of the American Legion.

Dr. Felix Revielle Brunot, New Orleans, and Miss Mary Bankerd Wagner, Pittsburg, were married June 9.

Dr. Charles A. Wallbillich, New Orleans, and Miss Emma Laura Sullivan, Tullahoma, Tenn., were married June 8.

Dr. J. D. Young, Covington, and Miss Helen Jansen were married June 17.

Deaths

Dr. William D. Roussell, Patterson, aged 54, died July 19.

MARYLAND

The State Department of Health plans to establish a bacteriologic laboratory on the eastern shore to overcome delays in examination of cultures from communicable disease cases. The new station, to serve as a branch of the Baltimore Laboratory, will be in operation by September 1.

The Washington County Health Demonstration has announced that a new diphtheria immunization clinic will be established in Hagerstown. The clinic will be modeled and conducted along the same lines as the clinics of Johns Hopkins Hospital, Baltimore, and Dr. Adolph S. Rumréich, of the Johns Hopkins School of Hygiene, will be in charge. The Johns Hopkins Department of Immunology will certify all material used at the clinic.

The $200,000 hospital building and kitchen of the Maryland State Sanatorium, Henrytown, is under construction.

Dr. Martin F. Sloan, formerly Director of the Eudowood Sanitarium, recently purchased a tract of 85 acres at Sparks, Baltimore County, on which he proposes to build a sanatorium for the treatment of lung diseases. The hospital will have accommodations for twelve patients, and as needs arise other units will be put up. The sanatorium will be known as Maple Heights Sanatorium.

Dr. George W. Corner, Associate Professor of Anatomy, Johns Hopkins University Medical School, Baltimore, has been appointed head of the Department of Anatomy in the new School of Medicine and Dentistry organized at the University of Rochester, N. Y.

Dr. Champe C. McCulloch, Jr., Colonel, M.C., U. S. Army, has been appointed full-time Health Officer for Allegany County.

Dr. Charles W. L. Johnson and Miss Ella Blackiston Conway, both of Baltimore, were married July 12.

Dr. Albert S. Horeb and Miss Katherine Augusta Rader, both of Baltimore, were married June 29.

Dr. Albert Franklin Shrier, Reistertown, and Miss Estelle R. Weiss were married at Elizabeth, N. J., June 7.

Deaths

Dr. John Ward Willson, Baltimore, aged 77, died June 24.

Dr. George W. Barkman, Govans, aged 71, died July 11.

(Continued on page 42)

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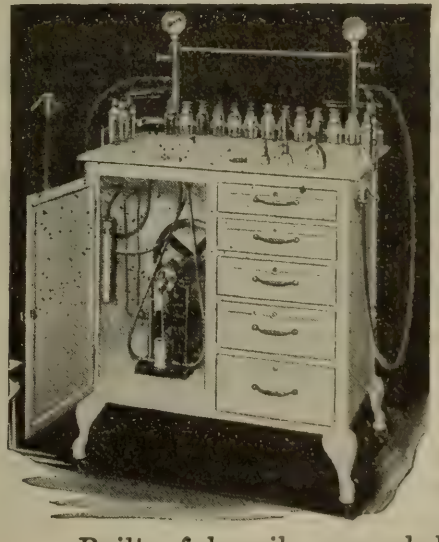

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(Continued from page 40)

MISSISSIPPI

Dr. Hosie Frank Magee, Jackson, and Miss Jim Haley, Crystal Springs, were married June 28.

MISSOURI

The Mid-Western Association of Anesthetists, at their meeting in St. Louis, elected the following officers: Dr. B. H. Harms, Omaha, Neb., President; Drs. Royal S. Adams, San Antonio, Tex., and Francis E. Haines, Chicago, Ill., Vice-Presidents; Dr. Morris H. Clark, Kansas City, Secretary-Treasurer.

The St. Louis Medical Society has purchased 150 feet of frontage near the Moolah Temple for the construction of a building for the Society. The new building will provide an auditorium seating between 500 and 1,000 persons and adequate room will be provided for the present library, which has outgrown its old quarters, and for future growth.

The thirty-fifth annual meeting of the Medical Society of the Missouri Valley will meet in St. Joseph September 21-22 under the Presidency of Dr. Paul E. Gardner. The Buchanan County Medical Society is preparing for a series of clinics to be held at the various hospitals of St. Joseph on Tuesday and Wednesday preceding the meeting, September 19-20.

Dr. John C. Jones has submitted his resignation as President of the State University.

Dr. Emmet P. North, St. Louis, has been reappointed a member of the State Board of Health.

Dr. Ola Putnam, Marceline, has completed plans for the erection of a $25,000 hospital in Marceline.

The Academy of Medicine of Kansas City has voted to establish a Clinical Week during the month of October every year. The clinics this year will be held October 3-6.

Dr. C. H. Wallace, St. Joseph, has been appointed a member of the Welfare Board to succeed Dr. Daniel Morton, resigned.

Dr. E. A. Greaves, Kansas City, has been appointed Physician, and Dr. John Deveney has been appointed dentist at the Municipal Farm.

(Continued on page 44)

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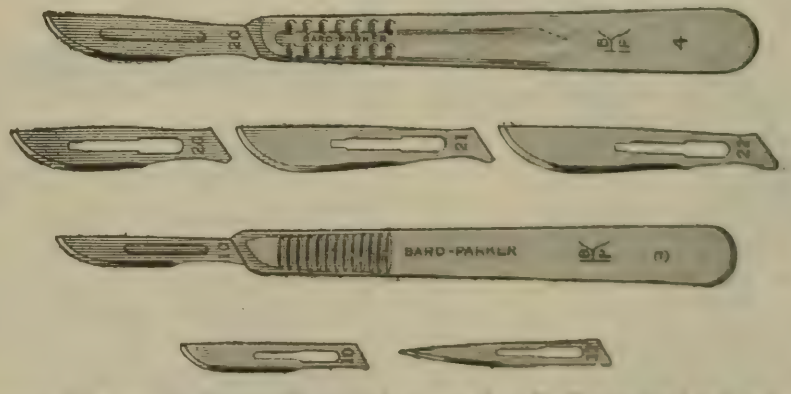

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(Continued from page 42)

Bids are being made for the erection of the $1,000,000 hospital at Jefferson Barracks, St. Louis.

Dr. J. W. Boger, Sedalia, has been appointed Pettis County Health Officer.

Dr. Frederick P. Gay has been elected Chairman of the Division of Medical Science of the National Research Council. Dr. Gay was formerly Professor of Pathology, University of California.

Plans have been completed for the $200,000 addition to St. John's Hospital, Springfield.

Dr. Henry L. Wolfner, St. Louis, has resigned as a member of the Board of Education.

Dr. Frank Hurwitt, Kansas City, has resigned as a member of the Health Department to accept a position as Physician for the Welfare Board.

Deaths

Dr. George W. Sellers, Mount Moriah, aged 80, died June 18.

Dr. Charles Williams, House Springs, aged 75, died July 8 from cerebral hemorrhage.

Dr. Ralph H. Williams, Bosworth, aged 63, died June 21 from peritonitis.

Dr. Charles A. Smith, Osceola, aged 48, died June 8.

NORTH CAROLINA

Park View Hospital, Rocky Mount, has recently completed an annex of fifteen rooms, installed a refrigerating plant, at an expense of over $20,000. The Hospital is owned by Drs. E. S. Boice and B. C. Willis.

Plans have been completed for the construction of a new $65,000 plant on the J. W. Snider farm at Swannanoa, which will be the future home of the Mountain Orphanage.

The U. S. Public Health Service Hospital, Oteen, will have two new buildings. With the completion of these two buildings by October 1 the Hospital will have a capacity of 1,300 beds.

Contracts have been awarded for the erection of a new county home about two miles from Halifax. The cost will be $40,000.

Dr. Parks M. King, Charlotte, and Miss Anna Howerton, Lexington, Va., were married June 27.

Dr. Harley N. Gould, Wake Forest, and Miss Mary Raymond, New Orleans, La., were married June 9.

Dr. Carlisle Calahan Cochran, Huntersville, and Miss Adelia John Everett were married June 6.

OKLAHOMA

Muskogee's Soldier Hospital will have new buildings to cost approximately $150,000, as follows: Two-story brick vocational training building, five duplex bungalows, one-story nurses' home, and a two-story house to be the home of the medical officer in charge.

Dr. Leo Joseph Starry, Oklahoma City, and Miss Maree Patch, Colorado Springs, Colo., were married June 21.

Dr. Williamson Haley Rogers, Wilson, and Miss Jaunita Tidmore, Abilene, Tex., were married June 19.

Deaths

Dr. Joseph C. Stevens, Drumright, died August 4.

Dr. Abner S. Crocker, Oklahoma City, aged 54, died July 13 at the State University Hospital from a bullet wound in the lung, having accidentally shot himself.

SOUTH CAROLINA

The Directors of the venereal disease clinics in Spartanburg, Orangeburg, Greenville and Columbia held a meeting in Columbia in June, when they discussed an educational campaign featuring the need of venereal disease clinics in each county in the State. The Federal Government has appropriated $3,583 for the venereal disease clinics in the State on condition that the clinics appropriate a like amount.

At the annual meeting of the South Carolina Association of County Health Officials in Charleston July 3-5, Dr. Luther A. Riser, Columbia, was re-elected President, and Dr. Leon Banov re-elected Secretary.

Deaths

Dr. John M. Crenshaw, Liberty, aged 65, died June 2.

Dr. Miles J. Walker, York, aged 65, died at a hospital in Richmond, Va., July 11.

Dr. John Robert Coleman, Shelton, died recently of acute lymphatic leukemia.

Dr. Lawrence Whiteford Nettles, Camden, aged 69, died June 26.

TENNESSEE

A County Sanatorium will be erected at Knoxville. There will be a central administration building for offices and nurses' quarters; also several cottages for patients will be erected.

The following appointments have been made to the new Veterans' Hospital, Memphis; Dr. Chester D. Allen, Officer-in-Charge; Dr. John W. Tippie, Executive Officer; Dr. A. G. Holland, Assistant Surgeon and Staff Officer; Marius Dahl, representative of the U. S. Veterans' Bureau, in charge of inventory.

The contract has been let for the construction of an addition to the City View Sanatorium, Nashville, at a cost of $115,000.

Dr. L. B. Snapp has been elected City Physician of Bristol to fill the unexpired term of Dr. J. A. Delaney, resigned.

The local antituberculosis association, Knoxville, has announced that more than $100,000 had been raised in a recent drive in that city to build a tuberculosis hospital.

Dr. Marion L. Bingham has resigned as Director of the Woman's Hygienic Department at the University of Tennessee and accepted a position with the Medical Department at Vassar College, Poughkeepsie, N. Y.

The Methodists are planning to build a hospital in Memphis. The one completed last spring has been sold to the Government.

Dr. H. W. Qualls, Union City, has been reappointed as a member of the State Board of Medical Examiners.

The Masons will erect a general hospital at Chattanooga as a monument to the city and to the fraternity.

Deaths

Dr. Britton O. Watkins, Kingston, aged 68, died June 30 from pulmonary tuberculosis.

Dr. R. M. Kimbrough, Rockwood, aged 88, died July 23.

Dr. G. W. North, Selmer, aged 40, died August 4.

Dr. William Jerome Bazemore, Chattanooga, aged 78, died recently.

Dr. Jacob L. Yarberry, Allensville, aged 64, died July 19.

(Continued on page 46)

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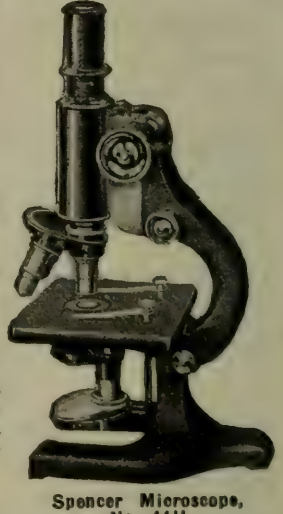

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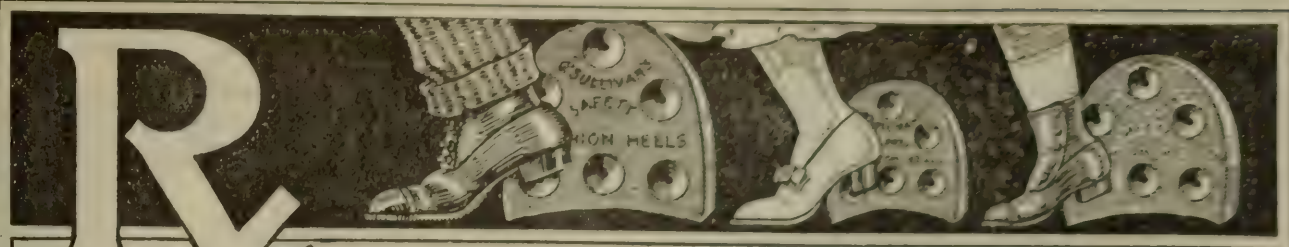

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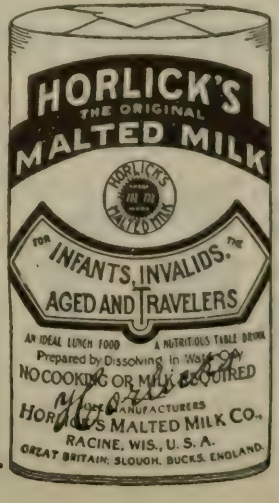
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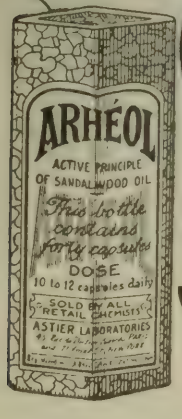

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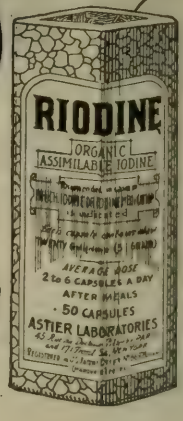

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(Continued from page 44)

TEXAS

Burleson County Medical Society has elected Dr. G. C. McLeod, Lyons, President, and Dr. B. O. McLean, Caldwell, Secretary.

Forty-nine physicians from widely scattered areas registered at the first graduate course held at the University of Texas, which concluded July 1. The course was very successful, so much so that it is expected to become an annual feature and will expand to large proportions.

The Knights Templar Hospital, at the Home for Aged Masons, Arlington, is building a twelve-bed addition to its plant. When completed it will have a capacity of forty-eight beds.

It has been announced that only eighty students will be admitted to the University of Texas Department of Medicine, Galveston, at the next session. Entrance will be based on scholarship and preference will be accorded men and women from Texas institutions. This action was made necessary by the inadequacy of the present buildings and laboratory equipment.

Deaths

Dr. Willis E. Kennemur, Sulphur Springs, aged 56, died July 3.

Dr. William H. Monday, Terrell, aged 79, died suddenly July 16.

Dr. Lucian Nicholson, Paris, aged 33, died May 4 from multiple abscesses of the lungs.

Dr. Eben Stedman Cox, Galveston, aged 63, died suddenly June 24.

Dr. Gustav Jack, Waco, aged 59, died June 14.

Dr. Rene Ryan Hopkins, Victoria, aged 75, died April 15.

Dr. A. N. Gray, Floyd, aged 52, died August 26.

Dr. Joseph G. Ellis, Denison, aged 73, died August 4.

VIRGINIA

The Marshall Lodge Memorial Hospital, Lynchburg, has opened two new units. Guests of honor at the opening were the donors whose gifts made the building possible. The Hospital represents an outlay of $200,000.

Dr. Moses Gellman, Richmond, has been elected Chief Resident Physician of the Hebrew Hospital, Baltimore.

Dr. Manfred Call has been elected Dean of the Medical College of Virginia, Richmond.

During the first two weeks in June twelve antituberculosis societies were organized in the State by the following counties: Isle of Wight, Southampton, Sussex, Prince George, Dinwiddie, Greensville, Brunswick, Nottoway, Amelia, Goochland, Charlotte and Halifax.

Norfolk County Medical Society has elected Dr. Julian L. Rawls, Berkley, President; Dr. Chas. W. Doughtie, Norfolk, Vice-President; Dr. Lockburn B. Scott, Norfolk, re-elected Secretary-Treasurer.

Dr. Charles Calhoun Hedges, Marietta, Ga., has been appointed Instructor in Anatomy at the University of Virginia.

Dr. Albert C. Lancaster, Martinsville, has been elected a member of the City Council.

Miss Celia Brian, R.N., has resigned as Superintendent of the General Hospital, Danville, and accepted the Superintendency of a hospital in Vermont.

At the recent meeting of the Virginia Pharmaceutical Association H. E. Orchard, Lynchburg, was elected President; A. L. I. Winne, Richmond, Secretary.

Dr. S. C. Hatcher, Ashland, has been appointed Chairman of the Commission on Mental Health, created by an act of the last General Assembly. Other members of the Commission are: Drs. Thomas S. Hening, Jefferson; William D. Prince, Stony Creek; William F. Drewry, Petersburg; Albert S. Priddy, Colony; Ennion G. Williams, Richmond; Paul V. Anderson, Richmond; Miss Annie Mann, Petersburg; Mr. Frank Bane, Richmond, Secretary; Mr. Harris Hart, Richmond; Mr. Charles A. Osborne, Richmond.

Dr. Percy Harris, recently appointed City Physician for Lynchburg, has resigned and will remain at Scottsville.

Dr. C. E. Wallace has been assigned to the Cape Charles Quarantine Station, Old Point Comfort, succeeding Dr. Floyd C. Turner, who has been transferred to Ellis Island, N. Y.

Dr. William L. Moss, of Boston, will be connected with the Medical College of Virginia, Richmond. He was for-

(Continued on page 48)

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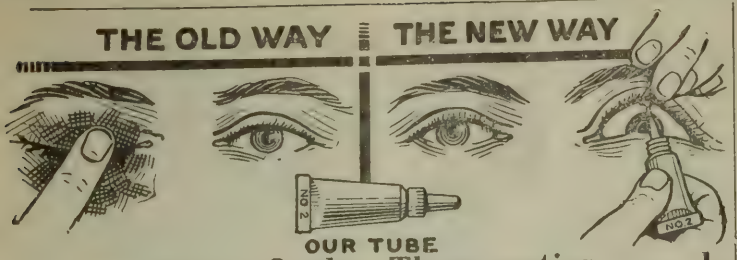

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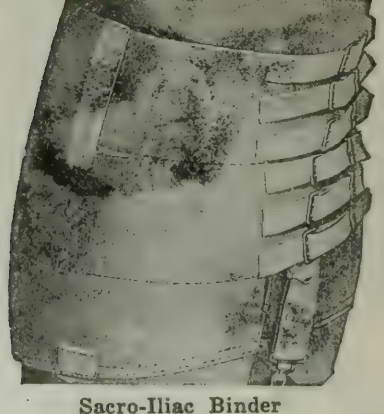

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(Continued from page 46)

merly Professor of Medicine at the Medical School of Harvard University.

The new physicians' building to be erected on Franklin Street, Richmond, will be known as the Medical Arts Building.

The following have been appointed on the Board of Criminal Mental Hygiene: Dr. W. F. Drewry, Petersburg; Dr. Finley Gayle, Richmond; Dr. J. K. Hall, Richmond; Mr. H. D. Coghill, Richmond, Secretary.

Dr. Frank Halvestine, Jr., Roanoke, has been appointed Instructor in Pathology at the University of Virginia, Charlottesville.

The eight permanent tuberculosis clinics in Virginia, supported in whole or in part by the money realized from the sale of tuberculosis Christmas seals, are located in Albermarle, Augusta, Halifax and Wise Counties; the cities of Newport News, Norfolk, Petersburg and Portsmouth.

Dr. Michael W. Minor, Comorn, has been elected President of the Board of Directors of the Bank of King George.

Dr. James Alexander Waddell, University, and Miss Mary C. Graves, Somerset, were married June 27.

Dr. Austin Ingram Dodson, Richmond, and Miss Louise Barham, Emporia, were married June 6.

Dr. John Kirk Richardson and Miss Irene Trotter Geisinger, both of Richmond, were married June 12.

Deaths

Dr. William P. Norris, Salem, aged 55, died suddenly July 23 from heart disease.

Dr. Edward Ashby Waugh, Lynchburg, aged 69, died July 9 from angina pectoris.

Dr. Bertram Hensel Gilmer, Cape Charles, aged 48, died in Richmond July 21.

WEST VIRGINIA

As a unit of the Huntington State Hospital, Huntington, a new Federal clinic for the diagnosis and treatment of mentally deficient ex-service men has recently been completed. The Hospital was erected at a cost of $80,000 and will accommodate fifty patients. Dr. L. V. Guthrie is Superintendent.

Mrs. Nellie Noel, Superintendent Nurse of the Princeton Hospital, has been appointed a member of the State Board of Examiners for Nurses, succeeding Dr. Irene Bullard.

Dr. Aaron Arkin, Professor of Pathology and Bacteriology, West Virginia School of Medicine, Morgantown, has been granted a year's leave of absence for study and research abroad. He will spend the year in Vienna, Berlin, Paris and London.

Dr. S. Lester, Witt, Va., has been appointed examining physician by the Norfolk and Western Railway and has moved to Bluefield.

Dr. George Marshall Lyon, Huntington, and Miss Virginia Berkley Sutherland, Washington, D. C., were married at Elkins June 24.

Deaths

Dr. Mary Virginia McCune-Rossa, Martinsburg, aged 63, died suddenly May 15.

Dr. Harvey Hinchman Pettry, Colcord, aged 53, died June 20 from gunshot wounds received when a pistol carried by him accidentally exploded.

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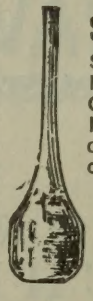

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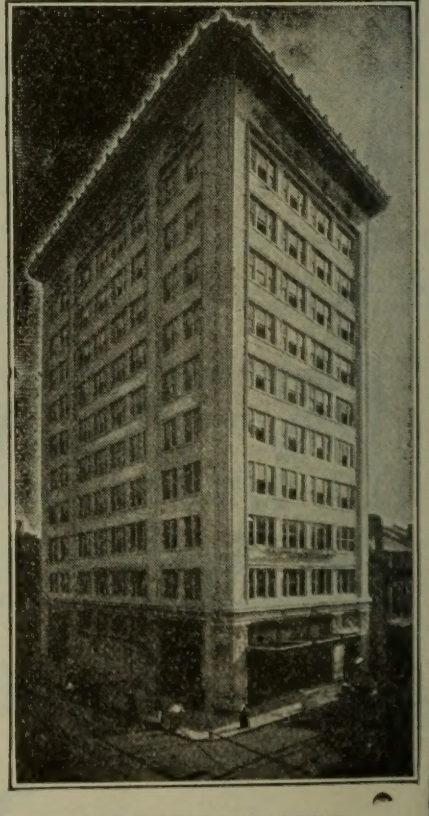

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The production of the highest degree of immunity depends on the use of an accurately balanced mixture. Over-neutralization lowers its potency. Under-neutralization undermines its safety.

Toxin-Antitoxin, P. D. & Co., is properly balanced to insure the highest immunizing effect consistent with safety.

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